Excavating Engineer

founded 1905

• Down 175 feet, a hydraulic clamshell crane clears rubble from slate pit floor. See page 30.

March, 1951

"Hydrocrane Great for Close-Quarter Digging"

Says Wisconsin Contractor

"With my H-2 Hydrocrane I can handle jobs other fellows can't begin to do," says Bill Johnvin, Mountain, Wis., contractor. "It's great for close-quarter digging, especially under overhanging branches. And I run into a lot of this while excavating basements and putting in septic tanks for folks building homes out in the woods."

Working in a heavily wooded section, Bill Johnvin's Hydrocrane widens and deepens a section of trout stream to make a pond. The telescopic boom and independent boom hoist combination is a real asset in this close quarter digging.

Johnvin excavates about 50 basements yearly, ranging in size from 24 x 24 to 50 x 50 ft., and handles an equal number of septic tank jobs. He has put in as many as three septic tanks a day. This includes digging tank pit, about 70 ft. of trench, and a hole for the dry well — plus setting the tank. Other jobs include loading logs and pulp wood, digging trout ponds and silo pits, and even digging graves.

This contractor says that his Hydrocrane paid for itself in the first year and a half of service, in addition to giving him a fair living.

Two Hydrocrane sizes— ¼-yd. 2-ton, ⅜-yd. 3-ton. Available with clamshell, crane hook, grapple, magnet, bulk materials bucket and catch basin cleaner. Send coupon for full details.

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HYDROCRANE DIVISION
South Milwaukee, Wisconsin

BUCYRUS ERIE

BUCYRUS-ERIE HYDROCRANE DIVISION
South Milwaukee, Wisconsin

Gentlemen: I want to know more about the profit possibilities of the Hydrocrane.

Name.....

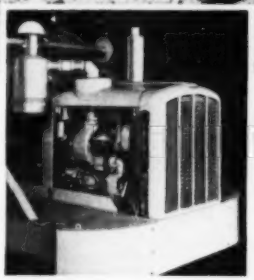
Company.....

Address.....

City.....State.....

68HS1C

Capable of digging speeds up to 136 inches per minute, Parsons 250 Trenchliner owned by Vanderver and Christian, Tyler, Texas, is powered with a 3-cylinder GM Series 71 Diesel engine delivering 89 H.P. at 1800 RPM. Mr. W. N. Christian says, "We are well pleased with this machine and the GM Diesel engine is giving excellent performance."



Faster Way
TO DIG A DITCH

THIS General Motors Diesel-powered Parsons 250 Trenchliner, powered by a General Motors Diesel, took on the toughest kind of a pipe-trench job—8 miles of 42" trench, depth to 17 feet—through soil ranging from hard red clay to sand. Line of travel was from Lake Tyler to Tyler, Texas, through rough, hilly country, across numerous creeks with "soft" approaches.

Jobs like this are a "natural" for GM Diesels because of their more efficient 2-cycle operation. With power at every piston downstroke, these engines start at the press of a button—give instant response to widely fluctuating power demands—and cut fuel costs to the core.

Discover for yourself how General Motors Series 71 Diesels can step up your production and lower your operating and maintenance costs. Get all the facts from your local GM Diesel dealer or write direct to us.

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SINGLE ENGINES... *Up to 275 H.P.* **DETROIT 28, MICHIGAN** MULTIPLE UNITS... *Up to 800 H.P.*

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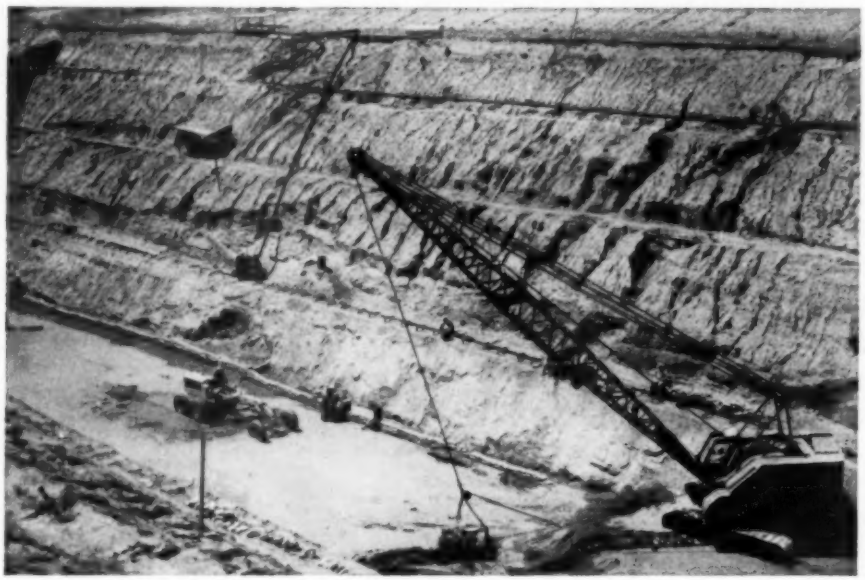
GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

WIRE ROPE



You'll have fewer shut-downs . . . cut replacement time with Roebling rope

YOU PAY FOR THE BEST when you buy wire rope. And you *get the best* when you buy Roebling Preformed "Blue Center" Steel Wire Rope. "Blue Center" steel is an exclusive Roebling product . . . gives rope the extra toughness that spells long life . . . service economy that really counts. Besides that, Roebling Preformed can be cut without seizing . . . always spools better . . . reduces vibration and whipping . . . doesn't tend to set or kink.

Roebling makes a wide range of wire rope . . . brings you the right construction, grade and size for top performance and economy on each installation. Have your Roebling Field Man help select the *best* rope for your particular requirements. And for maximum savings, get his suggestions on the proper use and maintenance of wire rope. He knows the case histories of thousands of installations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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Excavating Engineer

founded 1905

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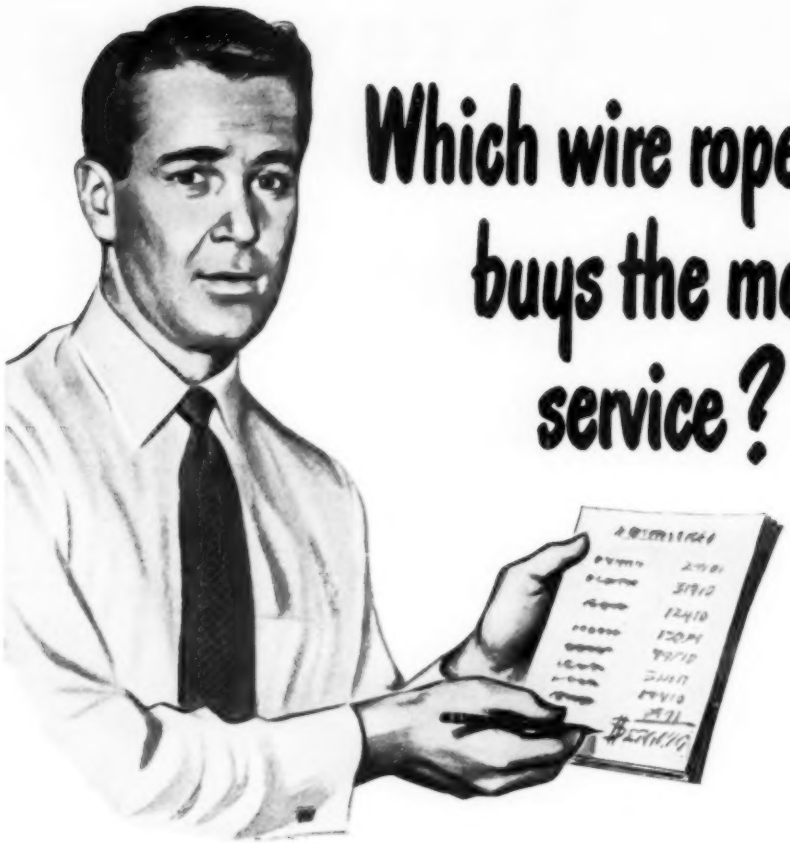

Which wire rope dollar buys the most service?

Isn't it true that when you purchase wire rope, you're actually buying service? Buying what the wire rope will do for you? Buying units of work?

The rope dollar that buys the most units of work has been wisely spent. Can you tell which brand of rope is giving you the most for your money? There are many users who can—by keeping records of wire-rope performance. They know what constitutes good, average service in terms of ton-miles, yards of rock moved, etc. When a certain brand gives better-than-average service over a period of years, they know they're getting a big return on the dollars spent for that brand.

Their figures prove it. That's why Bethlehem urges the keeping of records—records that show rope costs per unit of work. For we feel that in any such comparisons, Bethlehem rope will stand out from the crowd . . . in a way that will please the user's pocketbook.

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. . . and the easy jobs take care of themselves!

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It has everything a real Rock Shovel needs and when you have a real Rock Shovel you never have to worry about output in any kind of digging.

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"... $26,500,000 worth of U.S. Savings Bonds a year under company Payroll Savings Plan..."

CHARLES E. WILSON

"General Electric employees are buying more than $26,500,000 worth of U. S. Savings Bonds a year under company payroll savings plans. Since the inception of our savings plans in 1917, General Electric employees have saved $445,000,000 of which $280,000,000 consisted of the purchase of United States Savings Bonds since May, 1941. The record speaks for itself."

The record of General Electric Company, and the records of more than 21,000 other large companies, prove that employees *want* to save the easy, automatic way—the Payroll Savings Plan.

As of November 1, 1950, more than 8,000,000 employees were buying U. S. Savings Bonds *every month*. While the figure was impressive, it was not as large as it should have been—a fact recognized by many companies.

In November and December, top executives of literally thousands of large companies (employing one hundred or more) decided to check their Payroll Savings Plan and endeavor to increase participation to 60% or more.

Here are a few December reports: in one of the larger units of a leading steel corporation, participation went from 20% to 80.6 per cent . . . a well-known independent steel company (13,710 employees) reported 82% participation . . . another large steel company (100,000 employees), 75% participation . . . one plant of a large rubber corporation climbed to 94% (company average, all plants, 70%—and still going up). Tabulation of all companies exceeding 60% participation in December would literally fill this page.

Higher participation in the Payroll Savings Plan is good for the men and women for whom it builds security. It is good for the company because a saving employee is a better workman, a better citizen. It is good for the country because the month after month purchase of U. S. Savings Bonds by millions of Americans is a most effective check on inflationary tendencies.

Phone, write or wire, now, to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D.C. Your State Director has a simple, four-point promotion plan, concluding with a person to person canvass that puts a Payroll Savings Application Blank in the hands of every employee. That's all you have to do—and you'll be surprised at the response from employees who *want* to save.

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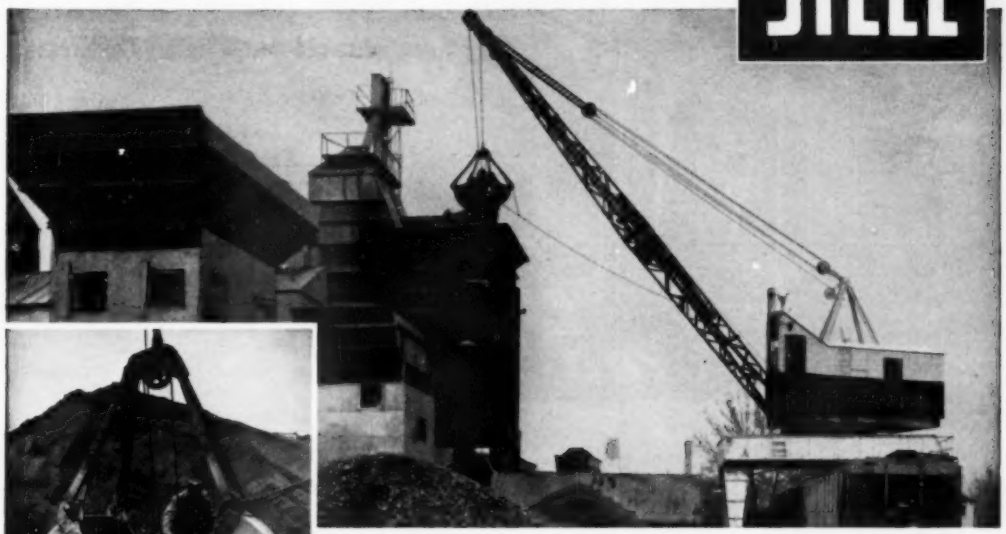
SOUTHERN MATERIALS COMPANY ALMOST DOUBLES WIRE ROPE SERVICE LIFE WITH J&L CENTERFIT

J&L STEEL



ABOVE: This Dravo C-14 whirler crane with a clamshell bucket moves hundreds of tons of sand and gravel daily. Holding and closing lines are J & L CenterFit wire rope.

LEFT: CenterFit closing line on this multiple reeved clamshell lasted an average of more than five weeks longer than competing ropes in this application.

J&L CenterFit Holding and Closing Lines Outlast Nearest Competitor by an Average of More Than 5 Weeks

Here's a report on the service life of J & L CenterFit Wire Rope from the Southern Materials Company, Richmond, Va., large producers and handlers of Sand, Gravel, Ready Mixed Concrete, SOLITE and Slag.

Southern Materials used a Dravo C-14 whirler crane with a 2 cu. yard clamshell bucket to test four competing brands of wire rope, among them J & L CenterFit wire rope.

Among the ten ropes tested J & L CenterFit holding and closing lines had an average service life of nearly twice that of the competing brands.

This is how the ten ropes compared:

Brand	Service Life
A	5 weeks 3 days 5 weeks 1 day 5 weeks 1 day
B	5 weeks 3 days 5 weeks 6 days
C	7 weeks 4 weeks 6 days
J&L CENTERFIT	10 WEEKS 2 DAYS 14 WEEKS 10 WEEKS

It's no wonder that equipment owners are turning to CenterFit—the new wire rope produced exclusively by J&L for use on equipment having small sheaves and drums.

Unlike conventional wire ropes CenterFit is laid together in one operation. All strands run in the same direction with outside strands fitting snugly into the valleys between inside strands. This unique construction means more steel and fewer voids than any conventional wire rope. The result: Higher Strength . . . Greater Flexibility . . . Easier Handling . . . Longer Service Life.

Get the facts on this new wire rope design. Write Jones & Laughlin Steel Corporation, 429 Jones and Laughlin Bldg., Pittsburgh 30, Pa., for our free booklet, "CenterFit".

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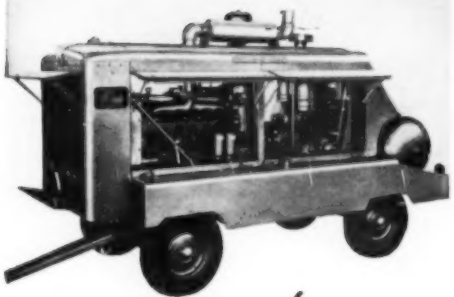

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A copy of the 28-page booklet containing the Standards may be had by sending 15 cents to the Superintendent of Documents, U. S. Printing Office, Washington 25, D. C. Ask for "Power Cranes and Shovels Commercial Standard CS90-49."

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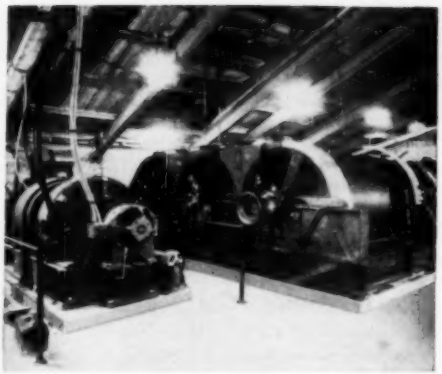
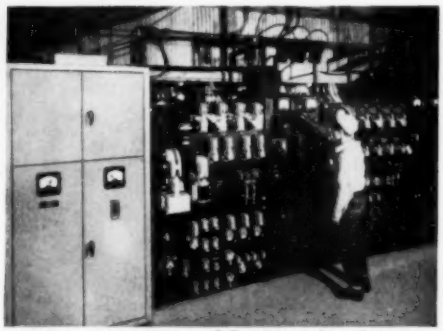


▲ Aerial cableway hoist room showing hoist drums and one of three General Electric motor-generator sets used to drive the powerful G-E 500-hp hoist motors.

◀ Concrete in 8-cubic-yard buckets is moved nearly half a mile on a G-E powered aerial cableway for placing concrete in the construction of Hungry Horse Dam.



Attendant adjusts voltage on G-E switchboard panel. At left is G-E Cabinetrol. Installation provides variable voltage for smooth, accurate speed control of cableway hoists.

BIG LIFT carries concrete across a canyon ... Electrically

G-E Powered Aerial Cableways Vital Link in Concrete Placing at Hungry Horse Dam

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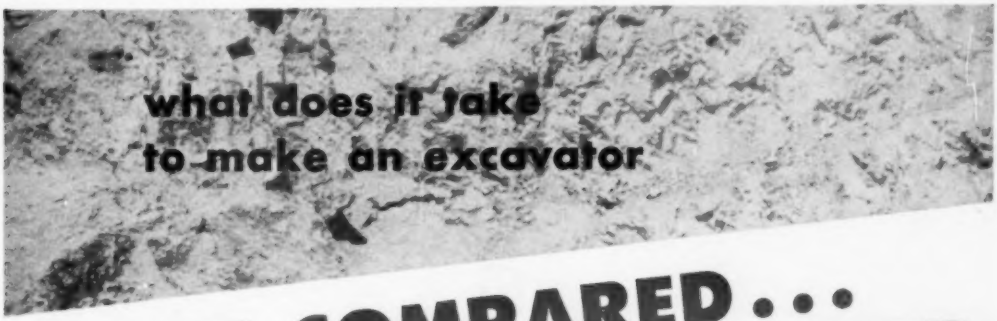

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WRITE for literature on any size PAYLOADER: the 1½ yard Model HM; the 1¼ yard HY; the ¾ yard HF; the ½ yard HE; the 12 cu. ft. HA. There is no obligation.

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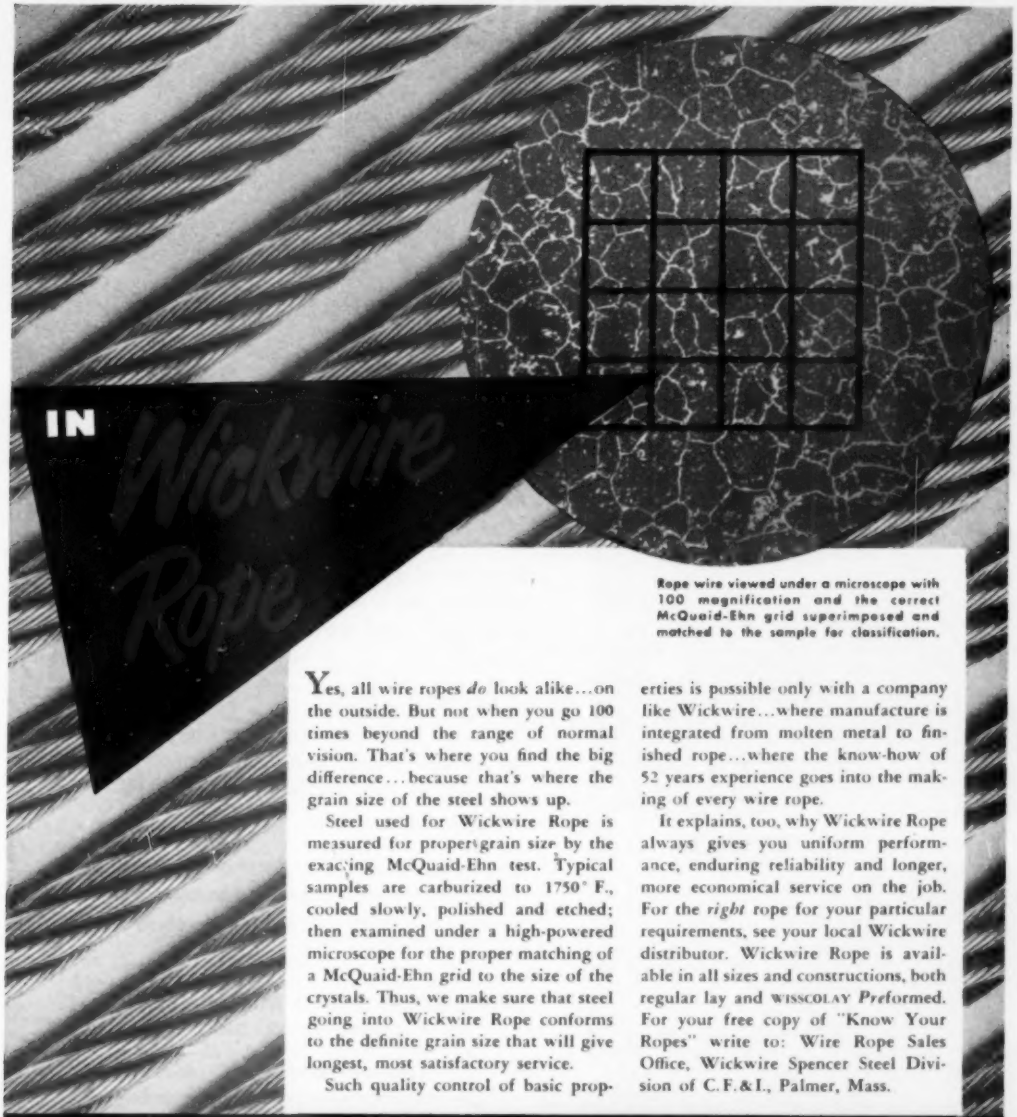
THERE'S MORE THAN MEETS THE EYE...



Rope wire viewed under a microscope with 100 magnification and the correct McQuaid-Ehn grid superimposed and matched to the sample for classification.

Yes, all wire ropes *do* look alike...on the outside. But not when you go 100 times beyond the range of normal vision. That's where you find the big difference...because that's where the grain size of the steel shows up.

Steel used for Wickwire Rope is measured for proper grain size by the exacting McQuaid-Ehn test. Typical samples are carburized to 1750° F., cooled slowly, polished and etched; then examined under a high-powered microscope for the proper matching of a McQuaid-Ehn grid to the size of the crystals. Thus, we make sure that steel going into Wickwire Rope conforms to the definite grain size that will give longest, most satisfactory service.

Such quality control of basic properties is possible only with a company like Wickwire...where manufacture is integrated from molten metal to finished rope...where the know-how of 52 years experience goes into the making of every wire rope.

It explains, too, why Wickwire Rope always gives you uniform performance, enduring reliability and longer, more economical service on the job. For the *right* rope for your particular requirements, see your local Wickwire distributor. Wickwire Rope is available in all sizes and constructions, both regular lay and WISCOLAY *Pre*formed. For your free copy of "Know Your Ropes" write to: Wire Rope Sales Office, Wickwire Spencer Steel Division of C.F.&I., Palmer, Mass.

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Hydraulic Dredges

A short review concerning one of the most effective and versatile of modern excavating tools. Article includes a brief history of the hydraulic dredge, explanation of its mechanical components and operation — and a glimpse into the future.

By J. E. Yager*

THE hydraulic dredge is by far the most popular underwater excavating machine in use in the United States today because it not only excavates the material as other dredges do but it is also capable of providing reasonably efficient transportation for that material, all in one machine. The power applied to the pump and cutter drive has steadily increased to the point where hydraulic dredges will outperform any other type of excavator where the type of ground and conditions are suitable for hydraulic dredging. The typical modern dredge, as illustrated above, is not just a mud or sand pumper but is capable of operating satisfactorily in coral rock, hardpan, boulder clay and even in well shattered rock.

The hydraulic dredge is not usually recommended for these harder materials and the output will be low and the maintenance cost relatively high, but within its limitations it will perform effectively. The spoil area for disposal of the material must be located within a reasonable distance from the dredge, although this may be increased by means of booster pumps. The material is delivered with a high percentage of water and provision must be made for retaining the solids and disposing of the excess water.

Conditions in the United States have been particularly favorable for the development of the cutterhead hydraulic pipeline dredge where projects for dredging harbors, rivers, canals, lakes, building new land, flood control levees, earthfill dams and related work demand a machine which can operate satisfactorily and economically in almost any kind of material.

Early Dredges

The first centrifugal pump that actually pumped water was made in 1705, but the development of a centrifugal dredging pump for handling a mixture of water and earth and its installation with properly coordinated machinery on a floating barge is comparatively recent. We find sketches and descriptions of dipper, bag and spoon, rake and bucket dredges dated as far back as the sixteenth century, but in 1864 the first successful European application of dredging with a centrifugal pump was done by a Frenchman, M. Bazin. This dredge was used at the Suez Canal and was purely a suction dredge.

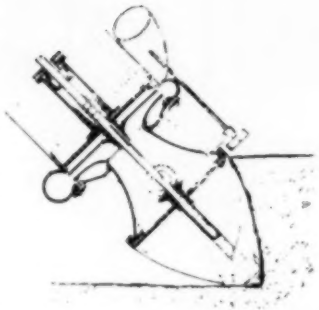
In 1867 Bazin sent to the Paris Exposition a model of a dredger which was equipped with an auxiliary device ahead of the pump suction for raking the ground loose, all mounted on a self-propelling ship. The satisfactory results obtained were attributed to the fact that there was a difference of two meters in the level of the water and the suc-

* *Estimating Engineer, Floating Machines — Bucyrus-Erie Co., South Milwaukee, Wis. This material was originally presented before the National Conference on Industrial Hydraulics.*

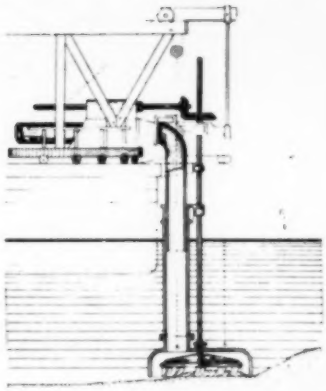
tion pipe in the ship, while the suction power of the pump was never mentioned.

The first centrifugal pump dredge in the United States was the self-loading and self-propelling hopper dredge *General Moultrie* built and operated at Charleston, S. C., in 1855. The pump was six feet in diameter and it used a 19-in. suction pipe. An agitator was fastened to the end of the pipe for stirring up the sand. The earliest recorded forerunner of our present day cutterhead was developed by Atkinson of Vermont in 1862 and improved by Duval of Baltimore in 1869 for his hydraulic dredge in Central America.

A centrifugal dredging pump with a revolving material cutting attachment was patented by A. W. Von Schmidt, and was used on a dredge in Oakland Harbor, Calif. It had a horizontal disc six feet in diameter to which were fastened a number of plow-shaped cutters. This disc was driven by a vertical shaft from the deck and worked with the cutters downward inside a hood which was connected to the centrifugal pump by a suction pipe 20 inches in diameter. The date of this invention, from available data, seems to have been about 1874. A combination pump and cutter device was patented in Germany by Savels in 1879 and has the pump and drive for the cutter located below water close to the suction inlet. The idea is excellent but no one has found a practical way to build it.



• A cutter and pump patented by Savels in Germany in 1879. Cutter shafting of alloy steel up to 13½-in. diameter is now in use.



• Von Schmidt's patent cutter and pump used in Oakland Harbor with a 20-in. pipe, about 1874.

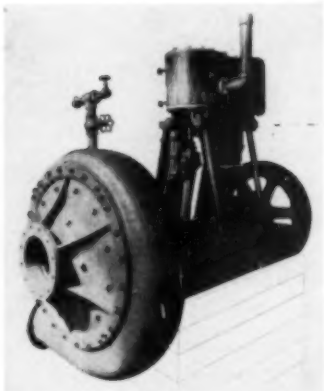
Early Dredges Used by Government

The real commercial development and use of hydraulic dredges in the United States seems to have started about 1893-94 with the construction of the Chicago Drainage Canal and the purchase of several 15-in. steam driven dredges by the United States Government. The hull and ladder frame were of wooden construction and the main dredging pump was driven by a 125-hp vertical compound engine. The contract requirements called for an output of 300 cubic yards of mud per hour through 300 feet of pipeline and 10-ft. elevation, with a maximum line length up to 1,000 feet.

In 1895 one of the first 20-in. dredges, the *Delaware*, was built for the American Dredging Co., Philadelphia, with a 450-hp triple expansion engine-driven pump developing a total head of 73 feet and represented a very definite forward step in dredge size and application of power.

These early dredges were strictly mud diggers, although some of them did have cutterheads of sorts, but it soon became evident that the hydraulic dredge was a most economical machine for excavating almost all classes of material, not only because of the large output, but also because of its ability to transport the excavated material through a pipeline, thus eliminating auxiliary means of transportation, such as tugs and scows.

During the construction of the New York Barge Canal, starting about 1907, hydraulic dredges were successfully designed and powered to handle hard



• Dredging steamer *Ram*, built in 1893 for the U. S. Government. At left is the 15-in. dredging pump driven by a 125-hp compound steam engine which was used on the *Ram*.

• The 8,000-cu. yd. seagoing hopper dredge *Essayons* is an $11 million machine belonging to the Corps of Engineers.

material such as cemented gravel and small boulders, material previously considered impossible for dredges of this type. This marked the beginning of the development of the heavy duty high powered hydraulic dredging plants which are now doing the major share of the underwater excavation work in the United States.

Types of Dredges

Hydraulic dredges may be grouped roughly into three general classifications based upon their method of excavating material.

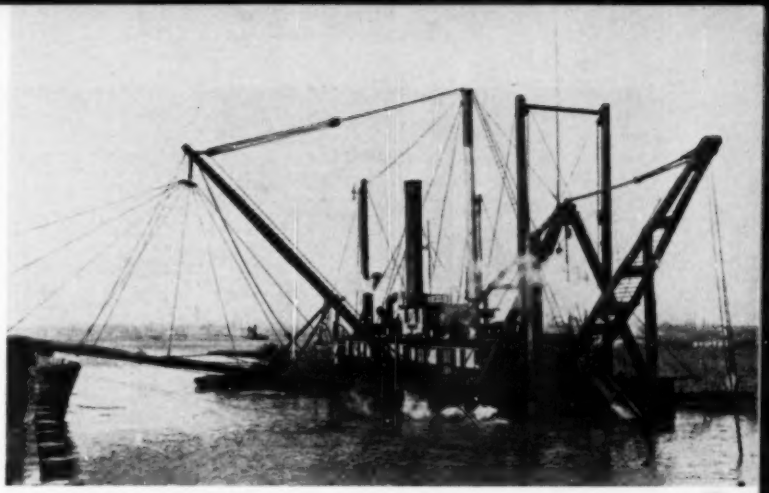
1. *Straight Suction Dredges.* This type depends primarily upon the action of the centrifugal pump to suck a mixture of free flowing material and water and are generally referred to as "sand suckers." Sometimes water delivered under high pressure through small nozzles at the suction mouth is used to assist in agitating the material.

2. *Drag Suction Dredges.* These are usually self-propelled hopper dredges with various designs of dragheads attached to the end of the suction pipe to drag along the bottom and agitate and suck up the mixture as the ship moves along. The material is generally discharged into hoppers built into the ship for transportation to the spoil area, and they are also often equipped to discharge as pipeline dredges.

The dust-pan suction dredges used by the U. S. Engineers for maintenance work on the Mississippi River and its tributaries are a variation of this type. Another is the U. S. Army, Corps of Engineers, $11 million, 8,000-yd. seagoing hopper dredge "Essayons," commissioned in January, 1950.

In 1900 a German engineer, Otto Fruhling, invented a special suction head which had its inlet at about 90° to the surface of the mud. This suction head is mounted on a heavy ladder structure and is lowered through a well along the center of the ship until sealed in the mud and kept in this position while the ship is propelled forward. In soft, greasy mud a mixture containing as high as 75% solids is forced through the suction pipe and pumped into the hoppers. These dredges are used mostly for maintenance dredging in Europe, South America and China where material and operating conditions are particularly suitable for their use.

3. *Cutterhead Dredges.* This is the development of the Von Schmidt patent into the cutterhead hydraulic dredge with which we are most familiar and the type which will be discussed here in further detail.



• The 20-in. hydraulic dredge *Delaware* with cutterhead, built in 1895.

Cutterhead Pipeline Dredges

All types of dredges are built in a great variety of detail to meet special operating conditions.

The general arrangement of a typical modern hydraulic dredge consists basically of:

1. A centrifugal dredging pump of special design for sucking a mixture of material and water through the suction inlet and suction pipe and driven by a motor, engine or turbine of sufficient power to force the mixture through a discharge pipeline.

2. A power driven revolving cutterhead to cut the material and feed it to the suction intake. The supporting structure for the cutterhead, its driving machinery and suction pipe is identified as the digging ladder and has its inner end supported on trunnions at or near the bow end of the dredge, and the outer end suspended by means of tackle block from a jib to permit raising and lowering the cutter.

3. Spuds at the stern end of the dredge serve as a pivot point for swinging and walking ahead.

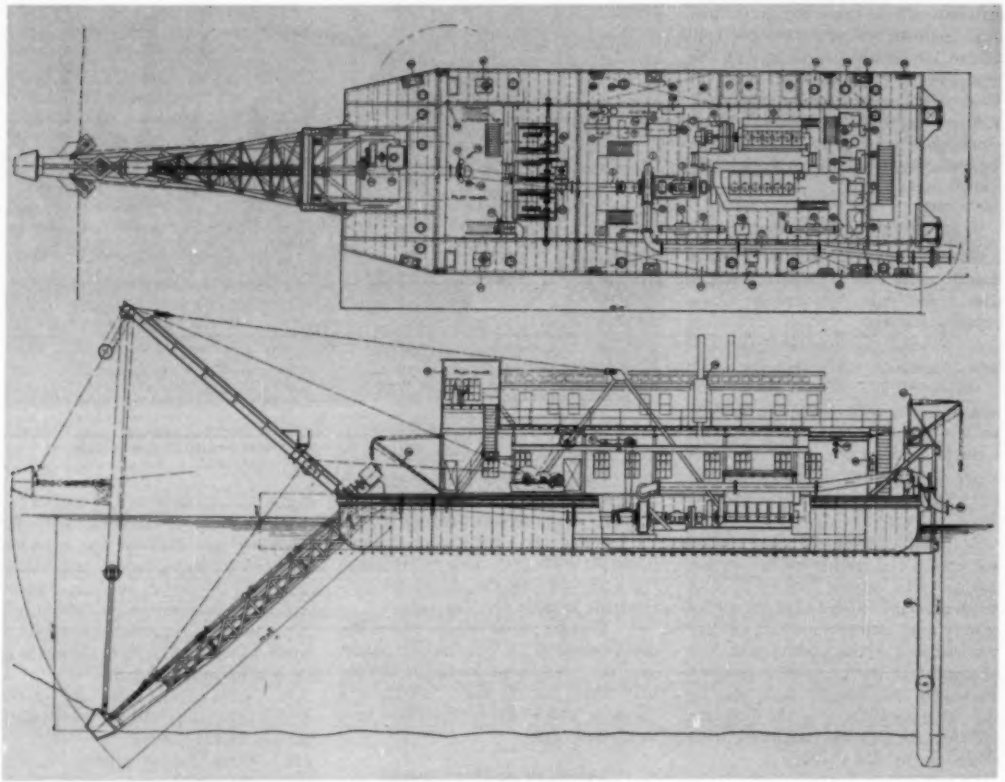
4. The hoist and winding machinery consisting of power-driven drums with wire ropes to control the movements of the dredge and to raise and lower the digging ladder and spuds.

5. The necessary auxiliary apparatus to provide a complete operating plant using either shore electric power or a self-contained steam or diesel power plant.

6. The floating hull or barge to properly support and provide flotation for the pump and related machinery.

7. The pipeline for transporting the mixture from the dredge to the spoil area.

The careful selection and design of



• General arrangement of typical modern hydraulic dredge with diesel engine driven pump and electric auxiliaries.

each of these basic units and proper coordination of all of the units is necessary to produce an efficient hydraulic dredge for digging and transporting material.

Control and Operation

The method of operating a hydraulic dredge with spuds is shown in the diagram and a brief explanation follows:

Wire ropes from the drums of the winch machinery lead over guide sheaves, located on the ladder just back of the cutterhead, to anchors on the port and starboard side and force or pull the cutterhead into the ground to be excavated. One of the spuds at the stern of the dredge acts as a pivot about which the hull swings from side to side. The ladder is lowered at each swing to cut a slice of material.

When the desired dredging depth has been reached, the ladder is raised and the dredge stepped ahead by using the second spud as a walking spud. The length of the step ahead is determined partially by the ability of the cutter to break up the material and partially by the necessity for making a new hole for the spud anchorage which will hold the dredge into the digging without breaking ground and dropping back.

Generally from ¾ feet to 1½ feet of new ground is required to anchor the spud. The length of the step ahead ranges from about ¾ up to possibly 1¼ times the cutter length. Once the step ahead has been made, the position of the dredge cannot be changed and variations to provide material for the pump feed requirements are made by changing the depth of the cut and swinging speed. The location of swing rope anchors are changed by an auxiliary work boat to maintain a proper rope lead as the dredge moves ahead.

Many dredge operators find it advantageous to use a special ship's compass with recording charts to accurately position the dredge for the width of the swing as well as the angle for stepping ahead and to provide a permanent record of the dredge's operation.

A brief description of the principal units which go to make up the cutterhead hydraulic pipeline dredge and the general theory entering into their design may be of interest.

The hydraulic dredge is generally identified by the diameter of the discharge pipe but unless the amount of power applied to the main dredging pump is specified, the description is inadequate. The 20-in. dredge of 1895 had a 450-hp pump; that of 1908-1910 about 750 hp; while today the modern general contractor's 20-in. dredge should be equipped with a prime mover on the pump developing 1,500 to 1,800 hp. Thirty-inch dredges were built in 1912 with a 1,500-hp main engine driving the pump but today the requirements are 4,000 to 6,000 hp.

The main pump is the controlling unit of the dredge around which all other units and parts are designed to place the least possible limitations upon its output.

The design of a pump to handle material, which may range from soft

mud and silt to sticky clay, gravel, coral and boulders through variable lengths of pipeline and elevation, represents a considerable compromise between the recognized theoretical factors for building an efficient water pump and the practical considerations necessary when designing a material handling pump.

The passages through the impeller and casing must provide areas at least 70 to 80% of the discharge pipe, gradually increasing from suction to discharge to prevent clogging. Controlled variable speed is essential for a good pump drive as the pump seldom operates under the exact pipeline conditions and specific gravity of mixture for which it was designed. Pump efficiencies will most likely range from 50 to 60% with a maximum of 65 to 70% under the most favorable conditions.

Friction Loss Big Factor

The greater part of the applied pumping power is usually required to overcome friction loss in the pipeline. Additional power is also necessary for elevating the mixture above the water line to overcome the entrance loss and friction in the suction pipe and the velocity head.

Friction loss in a dredge pipeline varies greatly with the character, specific gravity, particle size and shape of the material as well as with the pipeline velocity. Many more or less complicated formulas for friction loss for clear water in pipelines under variable conditions are available but are not applicable when moving a mixture of material and water through pipelines having numerous connecting joints, valves, pockets and other obstructions. We have had the best results using a simplified form of the Williams-Hazen formula for clear water:

$$F = \frac{9.5V^{1.85}}{D^{1.25}}$$

where:

F=friction loss per thousand feet of average shore and floating pipeline for clear water.

V=velocity in feet per second.

D=diameter of pipe in inches.

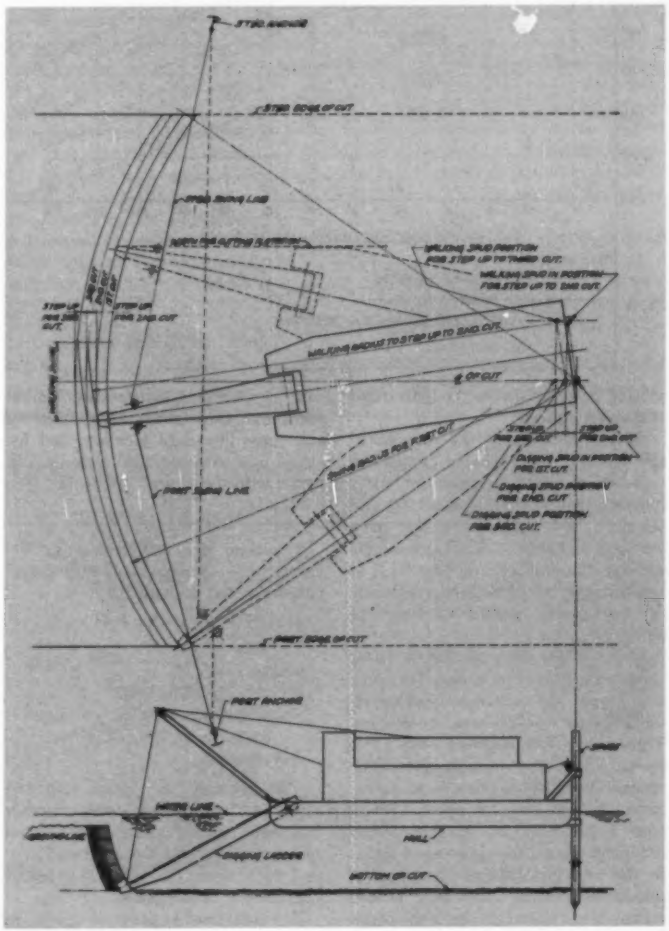
The general characteristics of this formula is about equivalent to using a "C" factor in Williams-Hazen formula ranging from 125 in a 12-in. line to 131 in a 30-in. line.

The value of "F" is increased when material is introduced into the stream and the increase varies with the character of the material and the velocity of the stream. It may be assumed that at velocities of 30 fps most pumpable solids are in suspension and that the friction loss for a mixture at this velocity is about the same as that of water.

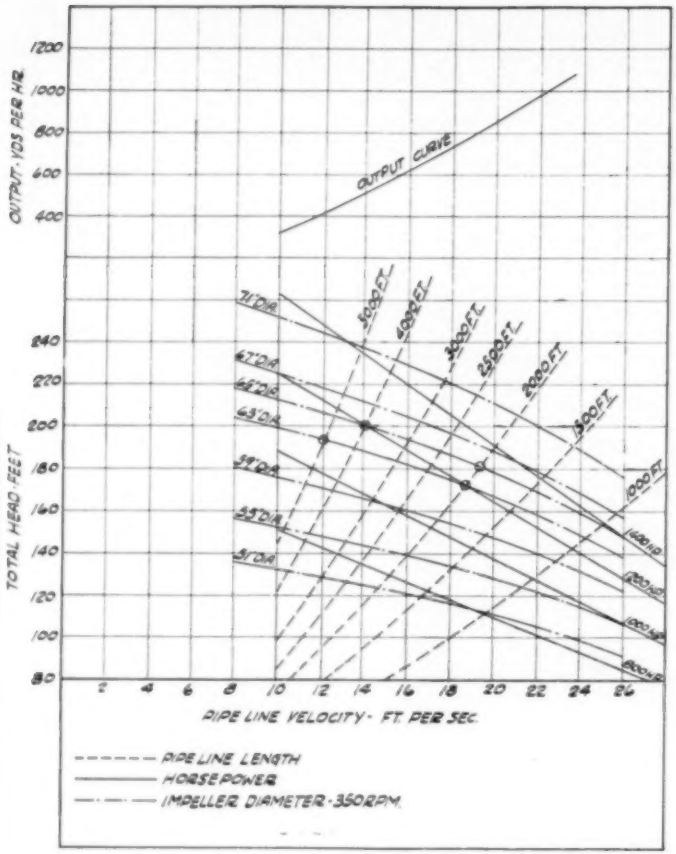
Determine Velocity by Material

The most economical velocity is that which keeps the mixture moving and will vary in practice from a minimum of about 10 fps for mud and silt to 20 fps or more for heavy clay, hardpan, gravel, or heavy coral. The selection of the most economical velocity is of prime importance in determining the power requirements for the pump. Long pipelines permit settling and require higher velocities to keep the material moving. Each material has a critical velocity below which the output falls off very rapidly.

The practical usable vacuum for bringing material to the pump is 22 inches to 25 inches at sea level and in some classes of free flowing material, the limiting factor for output is the maximum vacuum which can be carried without plugging the suction. It is common practice in order to reduce the work load on the suction end of the dredge to make the suction pipe of larger diameter than the discharge. The area increase, on an average powered pump, is 25 to 30% with as much as 50% on a high powered pump. There may also be a maximum velocity for a given material abov which the output


STBD. SWING LINE
STBD. SIDE OF CUT
STBD. SWING LINE
NORTH END CUTTING SECTION
WALKING SPUD POSITION FOR STEP UP TO THIRD CUT
WALKING SPUD IN POSITION FOR STEP UP TO 2ND CUT
STEP UP FOR 3RD CUT
STEP UP FOR 2ND CUT
WALKING RADIUS TO STEP UP TO 2ND CUT
C OF CUT
STEP UP FOR 2ND CUT
STEP UP FOR 3RD CUT
DRAGLINE SPUD IN POSITION FOR 1ST CUT
DRAGLINE SPUD POSITION FOR 2ND CUT
DRAGLINE SPUD POSITION FOR 3RD CUT
SWING SPUD IN POSITION FOR 1ST CUT
PORT SWING LINE
PORT SIDE OF CUT
PORT ANCHOR
SPUD
WATER LINE
HULL
DREDGING LADDER
BOTTOM OF CUT

• Method of operating a cutterhead hydraulic pipeline dredge with spuds and swing lines.



• Characteristic curves for a dredging pump working in easily pumped material.

will not increase, due to the limitations of the suction feed.

Having determined the economical velocity and the probable percentage of solids at which the material under consideration may be pumped, we can calculate the friction loss for any given length of pipeline; to this will be added the elevation and the vacuum head to establish the total head and eventually the horsepower applied to drive the pump.

More or less arbitrary limits, based on experience and judgment, for maximum power and maximum head are established for various sizes of dredges. These range from approximately 1,000 hp and 90 psi on a 16-in. pump to 6,000 hp and about 150 psi on a 30-in. pump, although top pressures up to 175 psi have been developed in single stage dredging pumps. An important factor in the determination of the practical maximum pressure which may be used on any given size of dredge is the necessity for providing satisfactory flexible joints and connections in the floating and shore discharge pipelines and for economical reasons this also usually varies with the size of the dredge.

Figuring Total Head

The total head which may be developed by a pump impeller is determined by the formula

$$H=\frac{(S)^2}{(A)} \text{ or } S=A\sqrt{2gH}$$

where:

H=total head in feet.

S=peripheral velocity of impeller vane tips in feet per second.

A=constant

The constant "A" varies with exit angle of the impeller vanes, number and shape of vanes, diameter of suction eye and velocity of flow. We endeavor to keep a maximum vane tip speed of 120 fps for larger pumps.

The total head or pressure developed by the impeller increases as the square of the vane velocity, and inasmuch as abrasive material is usually being pumped and because the friction factor also increases approximately as the square of the velocity, abrasive wear will increase rapidly with higher pressures.

The chart on the left illustrates theoretical characteristic curves for an 18-in. dredging pump handling a mixture of easily pumped material through various lengths of pipeline. The curves show the relation between power required for pumping; the diameter of the impeller required to develop the necessary head for a selected length of pipeline; and the estimated output. They also illustrate how important it is to use the correct diameter of impeller to prevent overloading and to increase output, because with a fixed diameter of impeller the power varies as the square of the rpm and directly with the volume.

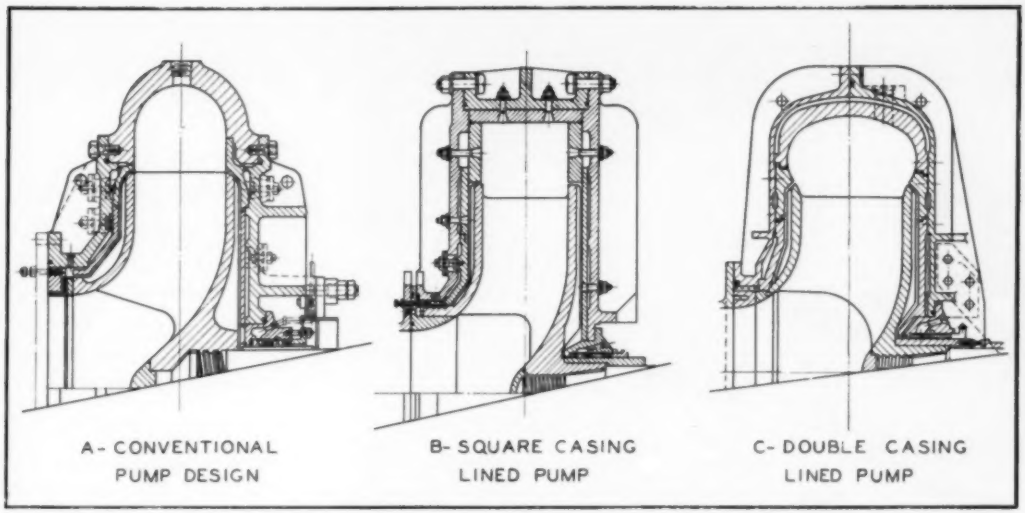
Design Parts for Long Life

The abrasive wear on all parts in contact with material requires readily renewable and weldable replacement parts. Efficiency is sacrificed to obtain large passages for material at low velocities. Various nickel, chromium, molybdenum, and manganese alloys for steel and iron parts, special heat treatment, hard facing, are all generously used to increase the life of wearing parts. Rubber nose rings and shoulder casing liners have been successfully used in some installations. Water seals and auxiliary vanes on the outer faces of the impeller shrouds to keep the mixture in motion toward the pump discharge are desirable.

It is interesting to note that tests have shown very little, if any, difference between the efficiency of a semicircular and a square section casing, and the choice is usually dictated by customer preference. The first illustration on page 21 depicts the conventional design. The square casing design has sectionalized replaceable liners of various selected materials. The complete inner casing lined pump and various modifications of this design use very hard iron inner casings supported by cast steel shells and are recommended for very abrasive materials.

Details of pump design vary greatly with different manufacturers.

The constantly changing materials



• Cross sections showing three typical dredging pump designs.

and pipeline conditions require flexibility in the pump characteristics and in the power unit which drives it. The type of material may change while swinging across the cut and almost certainly with the depth of cut. Pipelines are always being adjusted to meet conditions at the spoil area. Therefore, controlled variable speed is essential for the power unit driving the pump and speed reduction without power loss is desirable if it can be obtained at a reasonable cost.

Speed Control Methods

Speed control of steam engines, diesel engines and turbines is readily obtained by means of governors and throttle valves with speed and horsepower reduction about proportional. Steam turbines can be built to prevent loss of power at lower speed by the use of extra nozzles and higher steam pressure. The steam turbine with gear reduction is easily the most popular prime mover for large powered pump drives (1,500 hp and over) and its characteristics are such that it seems to "hunt" the load rather than maintain a set speed.

Alternating current motors provide speed control by means of secondary resistance in the form of grids or liquid slip regulators, wasting the power in heat loss. Various systems are available for salvaging the power loss on variable speed motors, but they are very expensive and seldom used on dredges.

Diesel electric dredges with self-contained power plants generating direct current provide excellent means for obtaining approximately constant horsepower variable speed control for the main pump and auxiliaries.

The variable speed controls for pump prime movers should provide for a minimum reduction of 10% up to a maximum of 30%.

Cutters and Cutter Drive

There are many and varied types and shapes of cutterheads and each operating company and dredge master has his own particular favorite obtained by changes and modifications in original designs until they are at least partially satisfied. The design of a cutterhead is a special study of the relative speed of the cutter blade and the swinging speed, as well as providing a cutting angle on the blade for smooth action and proper wear.

Power for driving the cutterhead may range from 50 hp on a light duty 15-in. or 16-in. dredge to 1,000 hp on a 30-in. dredge with provision for short time peak loads of 2,000 hp. Cutter speeds range from 10 to 30 rpm, and here again speed control to suit variable operating conditions and materials is

Continued on page 34

• Various types of cutterheads in use on hydraulic dredges.

Mexico's

Increased demand for the blue and pink aggregates found in Santa Fe district prompts four of Mexico City's sand mines to turn to power equipment. I.C.A. pit shows way with four power shovels.

By Luisa Maria Alvarez

• A miscellaneous array of trucks waits for the 2-yd. P&H shovel in background to load some of the fine, pink sand at *Peña Blanca* mine.

• Below: Jose Luis Roqueñi, superintendent of *La Esperanza* mine, watches ¾-yd. Link-Belt Speeder load blue sand to a Ford Truck.

• Right: International TD-18 with Bucyrus-Erie dozer cuts a haul road at *La Esperanza* through what was originally a small hill. Sheer cliff supports track of streetcar line which runs beneath wires at left.

Mechanized Sand Mines

DURING the last five years, most of the sand that has gone into construction of thousands of homes and apartment buildings erected to house Mexico City's increasing population and the factories that have mushroomed over the industrial sections of the city, has been taken from the Santa Fe sand mines.

Sand mining in Santa Fe began in 1920 and for most of the time since then has been carried on with hand labor and comparatively rudimentary tools. It was not until three years ago that the first machine, a P & H 1½-yd. shovel, was brought in by Col. Armando Paredes Arroyo to increase production at his mine.

40 Mines in Area

The Santa Fe mines now in operation, about 40 of them in close proximity, are located in the Santa Fe section of San Angel, a suburb 30 minutes drive from Mexico City's business district.

The San Angel suburb and the adjoining one of Mixcoac are rich in sand and gravel mines, formations probably due to glaciation.

There are four big mines in the Santa Fe group: the *Peña Blanca* owned by Col. Armando Paredes Arroyo, operating two P&H shovels, one a 2-yd. 855-B and the other a 1½-yd. 655-B, and an Allis-Chalmers HD-14 tractor with Gar Wood dozer; señor Fernando Rueda's mine, using an LS-85 Link-Belt Speeder, and a ⅜-yd. model E Quick Way shovel; señor Eugenio de la Torre's, mine operating a Link-Belt which is taking out some 1,000 tons of stone a day which are used mainly for making sewage conduction pipes; and the last and most important, *La Esperanza*, owned and operated by the I.C.A. (Associated Civil Engineers). All the other Santa Fe mines are worked by hand. All production from these mines is used in Mexico's Federal District, principally for concrete, masonry and tile.

Every bit of sand and gravel necessary for the vast I.C.A. construction program in the Federal District, including roads, sewage systems and urban buildings, is obtained from *La Esperanza*. José Luis Roqueñi has been superintendent of the mine since 1946, when operation of quarry began.

I.C.A. Mine Typical

A visit to the I.C.A. mine shows typical operation in the Santa Fe district where power machinery has been brought into use. To reach *La Esperanza* one must drive southeast from Mexico City on the Royal Highway to Toluca, which was originally built during Mexico's early colonial period. This historic road passes Iztaccihuatl — the white woman — an extinct and snow clad volcano that resembles a woman lying upon her back.

The road toward Santa Fe climbs gently, passing corn fields dotted here and there by clumps of cactus, and finally winds, some 1,200 feet above Mexico City, into the sand mine area. The line of eucalyptus trees flanking the road is broken at intervals by driveways into the different mines.

As we turned left to *La Esperanza* mine grounds, a car coming from the

● At *Peña Blanca* mine Allis-Chalmers HD-14 with Gar Wood dozer moves sand into position for the loading shovel. Men on hill in center are using picks to dislodge material.

• Above: Sand is loosened and brought down by hand. Workers earn about 85c per day for this type of labor.

• Upper left: At *La Esperanza* 2-in. holes are sunk 18 feet deep, 21 feet apart to form the first bank, 162 feet high.

• Left: Link-Belt Speeder LS-85 loads Ford truck with blue sand. In spite of steep cliffs rising on every side, *La Esperanza* has had no major accidents during four years of operation.

• Below: 1¼-yd. Bay City 51 loads Ford truck with blue sand and gravel for the sifter chutes.

opposite direction veered toward the same driveway. Both cars stopped. Mr. Roqueñi, who drove us out to the I.C.A. mine, bowed to the driver of the other car and said, "Pase usted," meaning "Pass ahead." The man bowed slightly and answered, "After you, sir."

Doze Out Access Road

This old world courtesy seemed most appropriate on the old Royal Highway. Mr. Roqueñi drove in, over the access road that curves downward into the mine pit.

This access road, one mile long, was built by the mine owners in 1946. An International TD-18 crawler equipped with Bucyrus-Erie bulldozer was used for the cleaning job.

The pit, half-circle shaped, is about 150 yards wide at its central point. The walls of the pit are almost perpendicular to obtain maximum advantage from blasting.

Drill 2-in. Blast Holes

Two-inch diameter, 18-ft. deep blast holes were drilled in order to form the first bank which is now 162 feet high. Under a seam 18 feet deep there is a strata, some 16 feet deep, of inferior quality pink sand and immediately below this is an excellent blue sand which contains no impurities and runs down more than 114 feet, as far as exploitation to date shows.

The physical characteristics of *La Esperanza* blue sand are: specific gravity, 2.45; absorption capacity, 4.50; volume weight, 1,533 kilograms per cubic meter; loss by washing, 17.4%, and fineness modules, 2.4.

Two hundred and eighty tons of overburden are stripped daily and dumped into a ravine about 450 yards

from the pit. Four shovels are used for stripping and loading out the raw aggregate. They include: a 1¼-yd. Bucyrus-Erie, a 1¼-yd. Bay City, a ¾-yd. Quick Way and a ¼-yd. Link Belt Speeder.

The stone is not crushed because the cost of extracting usable sand is less. The blue material, which is used for concrete, is 30% waste. The pink, used for masonry, has 50% waste. Difference is due to the fact that both blue sand and gravel are used in construction while of the pink material only the sand is utilized.

Clean Holes by Hand

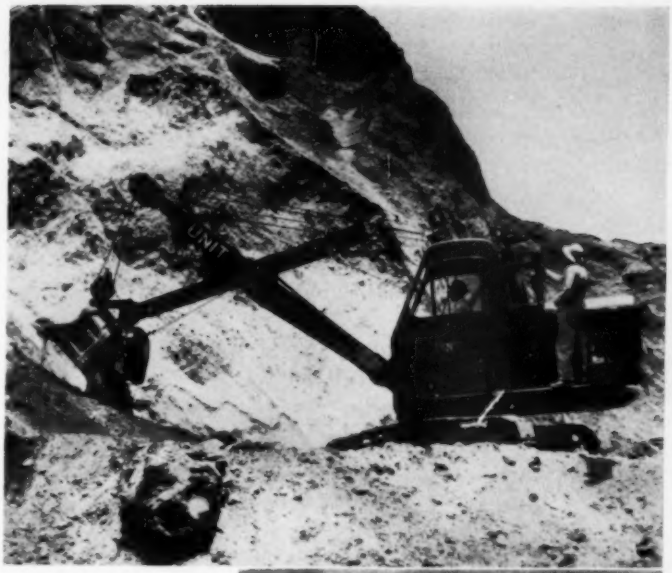
The drill holes, spaced 21 feet apart, are made by hand-operated jackhammers. Water and clay are poured in and the hole is cleaned with a wooden pole. Average drilling time is five hours per hole. The bottom is stacked with dynamite, Atlas 40% strength, and the rest of the hole filled with Compañia Mexicana gunpowder and set off by electric blasting caps. Two or three holes are shot at once. One hundred and fifty pounds of gunpowder are used for these holes and from 37 to 46 tons of rock are brought down per pound of explosive. Fragmentation is excellent. Eight tons of granulated gunpowder are used monthly and nine boxes of gelatin extra, 40% dynamite.

Name Machines

A special proud fondness for the machinery and tools they handle is characteristic of Mexican workers. They seem to credit the machine with a specific personality and hence often give it a name, such as "The Eagle," "Faithful," "Comrade," "Fighter," etc.

The shovels load raw stone to 25 trucks (17 Fords, 6 Internationals and 1 Reo, all 1946 and 1947 models). The smaller Fords haul 4½ tons. The other trucks haul 7½ tons. Loads cannot be greater because of the steep slopes traversed. For transportation of sand and gravel to the construction jobs, 30 Ford trucks, 1948 and 1949 models, are used.

The road traversed by the loaded trucks from the pit to the sifter chutes is some 520 yards long, with a 10% slope. On the summit of a hillock the trucks deposit their loads for classifying. A truck dumps 4½ or 7½ tons, on a slanting iron grill with bars being spaced at 6½ inches. The purpose of this first grill is to remove larger stones to avoid damage to a second grill on which sand and smaller stones fall through a funnel-shaped chute. The second grill is sloped 45°, the space between its iron bars being 1½ inches. Stones which do not pass through are all waste material. All that does pass is good construction material which drops to a screen sifter angled at 45° with four squares to each square inch and which separates gravel from sand. Four chute mouths deliver blue sand to the waiting trucks; blue gravel, called *confitillo* pours from two other chutes; waste material from two more and pink sand from the last two.



• *La Esperanza* employs a variety of small shovels such as this Unit, here rehandling blue sand prior to loading.

• Right: Much of the sand mined at Santa Fe is still screened by hand although mechanization has increased profits and production.

• Lower right: *La Esperanza* has constructed sifter chutes for screening the sand and gravel.

Waste Trucked Away

The waste material is hauled 350 yards to the ravine and dumped there. The sand and gravel, screened, are hauled over the access road to the high-

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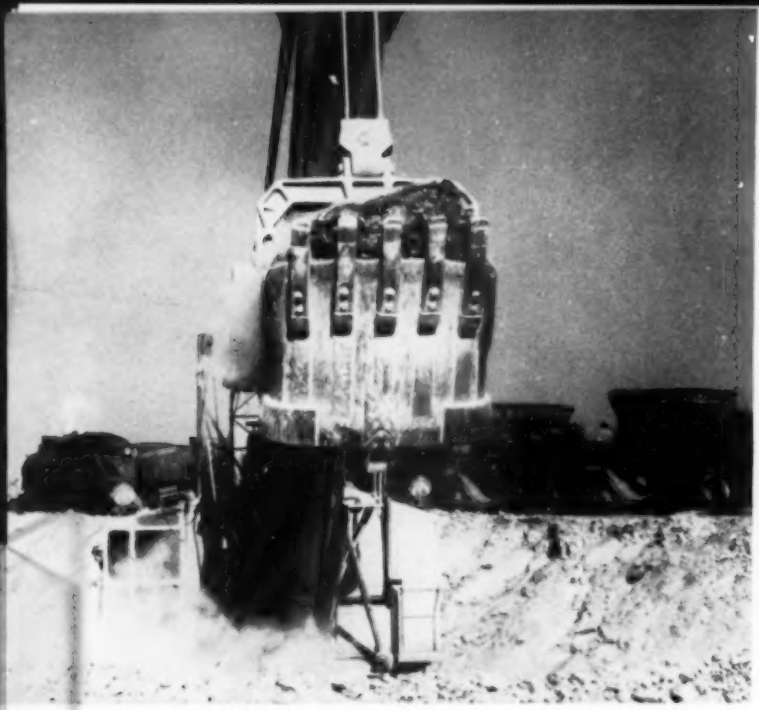

• On track in back of shovel is the ladle train with ladles full of molten, white hot slag from the nearby blast furnaces of Republic Steel Corp. Slag will be dumped in pit on far side of tracks and allowed to air cool for a week or 10 days.

• Pits of slag steam even after lying outdoors for a week. Note siren above operator's cab on the 120-B shovel. When shovel is completely hidden by steam, siren is used to signal train operator as to progress of loading.

• Reaching up through bank of steam emitted by slag beds, a Bucyrus-Erie 120-B electric shovel loads the material to side-dump gondola. Train carries slag to crushing and screening mill in background.

Hot Stuff!

IN the early years of the century, the term "waste product" could be applied to blast-furnace slag. Usually it was not only waste but an expensive nuisance. Although crushed slag had been used for railroad ballast since 1875, the demand only dented the yearly output of the material. Since blast furnaces are never shut down under normal conditions, a continuous supply of slag is being produced — 24 hours a day, every day in the year.

Wasting the slag thus became a big problem. Often, acreage was purchased in outlying districts and the steel companies paid to have the slag hauled and dumped on the property. Furnaces are usually situated in urban areas where there are no facilities for large-scale spoiling.

Find Ready Market

Now the picture has changed. Repeating the success story of many another industrial waste product blast-furnace slag today finds a ready market in many fields. A visit to the Wick Building headquarters of the Standard Slag Co. in downtown Youngstown, Ohio, will uncover some of the uses which make up the expanded market. Standard is the country's largest processor of this by-product of the blast furnace. They list the following as some of its current uses:

Macadam topping for roads.
Concrete aggregate
Railroad ballast
Insulation courses for roads
Bituminous concrete
Light weight aggregate
Surface treating
Roofing
Airport runways
Slag wool, building insulation
Screenings for agricultural fertilizer
Granulated slag, light weight building blocks
Filter medium for sewage disposal plants
Slag cement

A great deal of effort has been expended in the development of the slag market to create today's demand. And the slag companies themselves are far from satisfied. Standard Slag Co., for example, maintains an extensive laboratory at Bessemer, Pa. Here, tests are being constantly run on the slag being handled in the company's pits with an eye to developing new uses.

Composition Varies

One of the laboratory reports available in the Wick Building offices gives the composition of the material as it comes from the furnace. The percentages of the various components vary slightly because it is determined by such factors as the relative purity of the iron ore being processed at the time. However, this break-down is

Blast-furnace slag was at one time simply a waste product and, at the same time, was a real industrial problem. Through the efforts of companies like The Standard Slag Co. of Youngstown, Ohio, markets have been developed for the profitable use of blast-furnace slag throughout the nation, and it now has many applications in the aggregate industry.

• Shovel digs its way forward in pit which was filled level with railroad tracks on either side. Fork in tracks creates three pits like this, gives Youngstown plant plenty of capacity for never-ending supply of slag.

true enough to show the materials that may be found in an average piece of slag:

silica	36.63
alumina	9.75
lime	42.00
(important in agriculture)	
magnesia	7.45
manganese oxide	1.05
sulphur	1.58
iron oxide	.34
titanium oxide	.48
other	.72
Total	100.00

In a blast furnace, the charge consists of three layers — a bottom of coke, a center of iron ore and a topping of limestone, which is the agent used to draw out the sulphur and other impurities. The charge is subjected to a blast of hot air under pressure. The upper portion melts while the residue cooks in the hearth at the bottom. Eventually the slag rises while the pig iron settles to the bottom. Each is tapped at its own level — slag is run out of the higher part of the furnace (cinder notch) while iron is drained from the bottom (iron notch).

Composition Varies

Slag, then, consists of the impurities left over after the manufacture of pig or cast iron. And it is easy to see why the percentage composition is not constant. At the same time, variations are held within relatively narrow ranges because raw materials are selected carefully for quality and uniformity.

From the cinder notch, a runner or trough carries the slag away from the furnace. At most installations, the slag is directed either to a slag ladle or into a granulating pit. Depending upon which way it is handled as it comes from the furnace, slag takes three commercial forms.

If granulated slag is desired, the molten slag is run directly into a pit of water, causing the slag to expand into a relatively glassy, granulated product. It expands in the manner of popcorn and its weight per volume is about half that of slow cooling slag. Clamshell-equipped overhead cranes load it to railroad cars. The granulated output finds its use in cement and the insulation course for macadam or concrete top roads.

Air-cooled slag is the more common

• A semi of crushed slag is weighed out at Standard Slag's weighing house. Truck was loaded from hopper in crushing and screening mill in background.

• Earl Mayers, superintendent of the Standard Slag Co. plant in Youngstown, Ohio, stands beside company storeroom.

product. To form it, the molten slag is run into cast-iron or cast-steel ladles, usually of the side-dump type, mounted upon railroad trucks. A half-dozen of the filled ladles are coupled to a locomotive which pulls them to a large outdoor pit where they are dumped. Each ladle is supported by trunnions so that it can be emptied by tilting with a compressed-air or hydraulic steam cylinder or by an electric motor. This equipment is necessary so the white-hot slag may be spilled by remote control and no workmen need stand near the operation.

The preparation of this type of slag is characterized by slow cooling; often a week passes before it is crushed and screened. It then becomes the crushed slag used in the mixing of concrete.

A third type is lightweight slag which is a cross between air-cooled and granulated slag. The lightweight product is only partially expanded by the addition of specified amounts of water. It is used in the manufacture of lightweight building block.

Youngstown-Republic Plant

It is only a ¾-mile drive from Standard Slag Company's central offices in Youngstown to the site of one of their typical slag plants. It is located adjacent to five blast furnaces owned by the Republic Steel Corporation. Standard takes all the slag from four of the furnaces while the fifth produces granulated slag.

At the Republic plant, Standard's layout is of the modified pit type. The steel company's six-car ladle train hauls the molten slag from the furnaces to the pit area, a distance of about three-fourths of a mile. Where the pits begin, the railroad tracks fork into four parallel branches about 50 yards apart. Between these spur tracks, which are about a quarter mile long, lie three pits. When empty, they are about 20 feet deep.

Fill One Pit

The trainload of hot slag is poured into one of the empty pits. The pit selected will be used for dumping for a period of a week or ten days until it has been completely filled to a level with the tracks. During the time it

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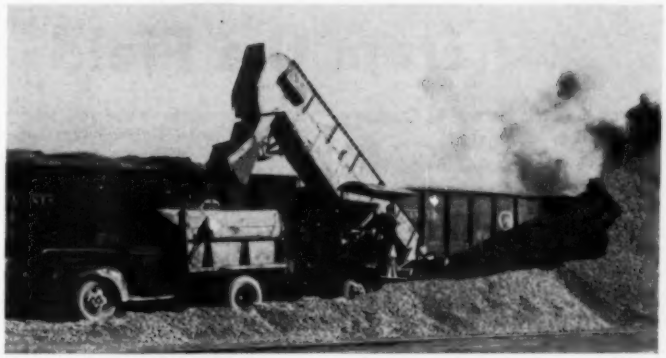
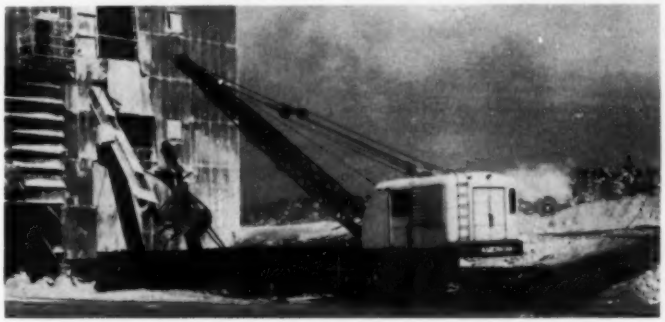


• Crushed and screened slag is loaded to customer's truck from stockpile. An 80W Haiss loader powered by Waukesha engine fills the truck in a few minutes time.



• Pieces of pig iron are separated from slag going into mill. Iron is sent back to blast furnaces. A 1¼-yd. American locomotive crane helps out here when not busy stockpiling slag in yards.

• In the pit of a subsidiary, Cleveland Slag Co., Cleveland, Ohio, a 2½-yd. Bucyrus-Erie 54-B electric shovel fills bottom-dump cars with raw slag. Trip to mill is considerably longer than at Youngstown plant.

News from the Field

Truck Crane Handles Quarry Rubble

Surrounded by four 175-ft. high walls, a truck-mounted ⅜-yd. clamshell (See cover) works year-round on the floor of the Arvonia-Buckingham Slate Co. quarry near Arvonia, Va. The excavator was lowered into the 600-ft. long by 400-ft. wide quarry in May of 1950 and has been operating there ever since. One of the five aerial cableways which service the quarry was used to place the machine in the pit. Fuel, grease and other supplies are sent down to it in the same way.

The Arvonia-Buckingham firm fabricates 25,000 to 30,000 roofing squares annually. The rubble which is cleared out of the quarry accumulates from two sources. Strata of unusable rock running through the slate beds must be blasted out and removed from the pit. Also, a certain amount of breakage and waste occurs in the quarrying of the slate blocks. It, too, must be hoisted aloft so the pit floor will be kept clean.

The truck excavator, a Bucyrus-Erie H-3 Hydrocrane, loads from 3,000 to 4,000 pounds of rubble into a shallow steel pan. The pan is then lifted to surface level, the rubble unloaded and spoiled. When not handling rubble, the truck crane assists in loading slate blocks to the pans. General Manager of the Arvonia-Buckingham Slate Co. is Thomas A. Yancey.

Announce NRBA Nominees

Paul B. Reinhold, president, Atlas Equipment Corp., Pittsburgh, Pa., has been designated as the official nominee for the 1951 presidency of the American Road Builders' Association and Jennings Randolph, assistant to president, Capital Airlines, Inc., Washington, D. C., has been designated Treasurer.

Balloting on the nomination of Mr. Reinhold to succeed Col. E. R. Needles, New York consulting engineer, as head of the 49-year old road builders organization, as well as for Mr. Randolph and official nominees for other ARBA positions, will take place between now and the three-day annual meeting of the association which opens in Milwaukee, March 12.

Turner Turnpike Underway

H. E. Bailey, Oklahoma state highway director, became general manager of the Turner Turnpike project of the Oklahoma Turnpike Authority in January. First work on the toll road to link Tulsa and Oklahoma City began December 19 with the award of a $396,554.73 contract to the Stamey Construction Co. of Oklahoma City for a 4-mile dirt moving and culvert work project between Tulsa and Sapulpa.

C. A. Stoldt became the new Oklahoma director of highways in February following his election by the highway commission upon recommendation of Gov. Murray.

The commission has granted leaves of absence to several employees to join the Oklahoma Turnpike Authority. They include W. D. Hoback, urban engineer, Maurice L. Cline, statistical department chief and R. L. Vaughan, attorney.

Place Large Tunnel Liner

The Lucky Peak Dam tunnel lining was completed in January as Olson Manufacturing Co. workmen moved the last huge 23-ft. section of the 1,138-ft. long tunnel into position. The lining, weighing 2¼ million pounds, was fabricated at the Olson factory and moved eight miles to the damsite.

Individual sections were 23 feet in diameter, 40 feet long and formed of ½-in. and ¾-in. plate with T-stiffener rings to give added strength. Olson's sub-contract called for fabrication, transporting and welding in place in the tunnel preparatory to the concrete pour. Prime contractor on the Army Engineer Corps project is Macco-Puget Sound.

A distinctive feature of the tunnel liner job is the mammoth trailer which Olson engineers designed for handling the huge pipe sections. Dubbed "Old Highpockets" the trailer is built around a Mack 6x6 tractor unit with a Larison compensating axle under the bogie.

A 66-ft. double beam section carries a series of expanding lattice rings to hold the pipe in position. Accurate placement of the load in the tunnel was achieved through four trailer-mounted cable winches air-powered with a 60-ft. compressor. Air-powered steering on the bogie permits maneuverability and gives the impression of a gigantic hook and ladder truck. After the pipe was set in concrete, the removable lattice rings were collapsed and taken back to the factory for another section.

An unusual factor which was one of the basic considerations in purchasing special equipment to handle this contract was portability. All of the equipment for cutting, bevelling, rolling, forming, handling and welding the steel for large diameter sections can easily be moved and set up at a location convenient to any similar large pipeline job any place in the West.

Iceland Boosts Good Roads

Iceland is a country of 39,000 square miles and 142,000 inhabitants, and it boasts one of the highest figures of road mileage per capita in the world. With no railroads, the country is entirely dependent upon its 10,600 motor vehicles, and good roads are a must.

Roads total about 4,000 miles, mostly gravel, built on an elevated bank of 10 to 16-ft. width. Recently modern American road and excavating machinery has greatly extended and im-

Continued on page 38

Walter Geist

Walter Geist, president of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., died suddenly Monday, Jan. 28. Mr. Geist, 56, had been chief executive of the industrial concern since 1942. He joined Allis-Chalmers in 1909.

Mr. Geist was named general sales representative for general machinery division in 1933. In this position, he supervised the activities of the 52 district sales offices which were in operation at that time. In 1939 he was elected a vice president in the general machinery division. In early 1942, he was selected as executive vice president and in May of that year he was elected president of the company.

In 1940 a group of distinguished scientists headed by Dr. Karl T. Compton, president of Massachusetts Institute of Technology, awarded him the plaque of the "Modern Pioneer."

He was honored in April, 1950, when he was presented with the Knights Cross, First Class, The Royal Order of St. Olav, by King Haakon VII of Norway.

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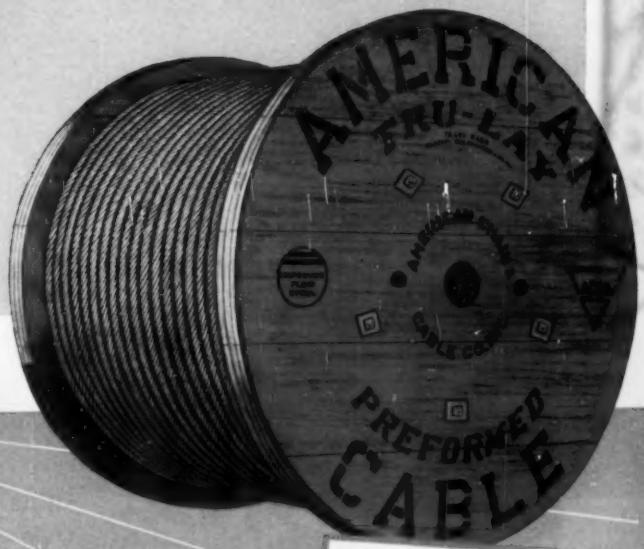

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In Business for Your Safety

ALSO MAKERS OF THE COMPLETE LINE OF
ACCO **Registered**
WIRE ROPE SLINGS

PULLING A 17-YARD SCRAPER, the TD-24 moves more paydirt in a faster time cycle to keep Highum and Wondra ahead of the contract time clause on Minnesota State Aid Road Number 9, near Clinton Falls, Minnesota.

IT'S "THE CHAMP"—the big red International TD-24—and here's what R. E. Highum says about it: "The easy quick-starting engine gets our equipment working sooner each day. Over a period of time that means a lot more profit for us. Economy in fuel, lubrication, and repairs is good. International parts delivery and service are tops."

Clean, quick shave for the face of Minnesota

How one contractor closes the work-gap with the TD-24

Up in the land of ten thousand lakes, the International TD-24 is doing a job of moving paydirt that would make any contractor sit up and take notice.

Highum and Wondra, Blooming Prairie, Minnesota, on a state road improvement contract, are a hundred percent for International—and here's why:

The TD-24 on the job rolled up 1,500 hours its first year with no downtime and not a cent for repairs.

Quick, all-weather starting—with International's exclusive push-button, gasoline-conversion starting system—gets equipment working sooner each day—doubly important where the snow flies early and stays late.

TD-24 hauls a bigger payload with a shorter time cycle—does more work with more speed.

Synchromesh transmission—you shift "on-the-go."

Planet Power steering with finger-tip control for pivot turns, feathered turns, turns with power on both tracks.

Reserve engine torque control—gives more lugging ability and increased drawbar pull for overloads.

Power—TD-24 delivers 148 maximum horsepower at the drawbar.

Ask the superintendents and the "skinners" on any TD-24 job. Ask to take the controls yourself. Then let your International Industrial Distributor show you what's in the TD-24 for you. You'll be a TD-24 man from then on in.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

INTERNATIONAL CRAWLERS MAKE SNOW TRAPS—deep snow ditches to keep the highway from drifting over in winter. A TD-9 and two TD-18's are on this job. One TD-18 has 4,500 hours in three years, the other has 9,600 hours in four years!

INTERNATIONAL HARVESTER

INTERNATIONAL

POWER THAT PAYS

• One of the two 30-in. straight electric dredges on the 30 million-yd. hydraulic fill job at Kingsley Dam, Neb.

Dredges

Continued from page 21

essential. Most all modern dredges provide electric power for motor drive of the cutter from diesel or steam driven generator sets. Ward Leonard control with its flexible speed-torque characteristics as well as control of maximum stalling torque is the most reliable and satisfactory drive for heavy duty dredges.

The terrific shock load when the cutter hits a boulder, submerged timber or steel rail, together with the stalling of the swing motion imposes high stresses not only on the cutter itself but also its driving shaft, gearing, ladder, trunnion and hull, all tending to limit the maximum power application. Cutter shafting of alloy steel up to 13½-in. diameter are now in use.

Normal dredging requirements can be met with digging ladders designed to reach a depth of 50 to 60 feet below water level. Ladder extensions to reach a maximum dredging depth of 100 feet have been used to meet special assignments, but these are usually short time unusual jobs. A straight suction dredge with jet agitator has successfully dredged fine copper tailings to a depth of 115 feet below water level.

Winch Machinery

The power for swinging the dredge back and forth across the cut and to raise and lower the ladder and spuds is provided by the winch or winding machinery, usually consisting of a 5-drum motor driven unit. An extra drum may be installed where a special three wire arrangement is substituted for the stern spuds. Sometimes when working on narrow cut or shallow digging jobs requiring frequent step ahead, two additional drums are provided to handle the anchors by means of swinging booms located at the forward end of the hull.

The most important function of the winding machinery is to keep the cutter in the digging when the cutter is undercutting (commonly is referred to as the digging swing), thus developing the full rated load of the cutter drive. When overcutting on the return swing, the swing pull is usually less and at higher speed, but in some types of material, the cutter will run away with the dredge and requires braking rather than pull. The handling of the ladder and spuds is done in the conventional manner of hoisting, lowering and braking.

The actual feed of material to the suction inlet is determined by the accurate control of the swing motion as in most dredging operations the operator sets the speed of the cutter drive to approximately suit the material in which he is working and then varies the swing speed to keep the pipeline loaded. Variable speed and torque control as obtained with the Ward Leonard system is most advantageous for winding gear. Consideration should be given in the design of larger dredges to independent motor driven units for the swing motions, as this would definitely improve and speed up dredging operations by eliminating the continual use of clutches and brakes.

Swing line pulls vary from about 15,000 to 20,000 pounds using ¾-in. to ⅞-in. diameter wire rope for 15-in. and 16-in. dredges to a maximum of 80,000 to 90,000 pounds stalling pull using 1⅜-in. or 1½-in. wire ropes on 30-in. dredges. The swinging power and speed is definitely related to, and a function of, the cutter power and speed.

Spuds React to Cutter

The spuds are designed to take the digging reactions through the hull structure from the cutter drive and swing loading. They may be round cylindrical pipe sections or square with long cylindrical points and depend upon their weight when dropping to penetrate into the earth or provide the anchorage for holding the dredge. Spuds may range in size from 10-in. or 12-in. to a maximum of 42-in. to 48-in. diameter or square and with weights up to 60 tons. The spuds are handled by means of drums and brakes on the winding machinery or preferably on larger dredges with an independent

spud hoisting unit. A special 3-wire triangle arrangement, often referred to as a "Christmas tree," is used when dredging to extreme depths, in rough water, ground swells or under conditions where rigid spuds are not practical.

Design Hull to Fit Job

The dredge hull is usually a flat deck barge with provisions for supporting the machinery and taking the load reactions from the ladder at the bow end and the spud reactions at the stern. In the case of self-powered dredges, steam or diesel, the hull becomes a complete independent floating power plant and requires as careful design as a small ship. Complete quarters for feeding and housing a crew of as many as 75 men are also often built on board. Many of the larger dredges are built with shipshape ends so that they are suitable for coastwise and ocean towing and can be readily moved long distances from one contract job to another. Watertight bulkheads and compartments with storage tanks for fuel and water supply and stores are built integral.

Need Skilled Operators

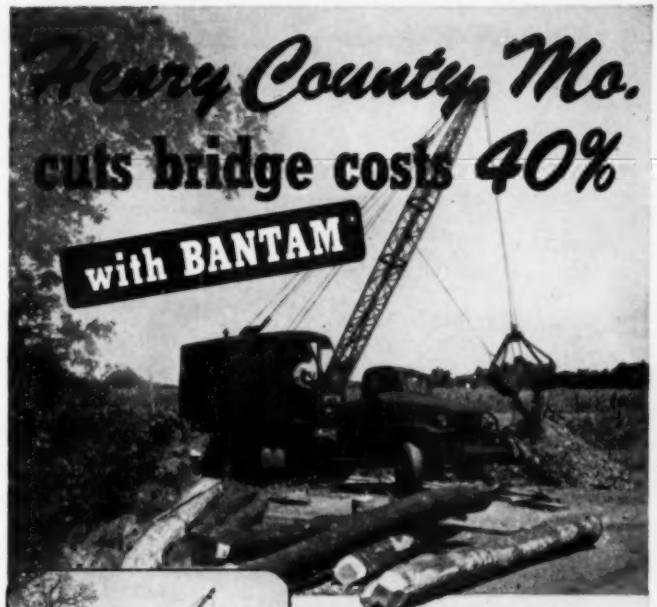
The efficient control of the output of the hydraulic dredge requires considerable skill on the part of the operator. He works without seeing the material that is excavated, or how it behaves during transportation through the dredge and pipeline, and only very seldom is the discharge at the spoil area visible. The good operator develops a marvelous sense of timing and feel, exercised primarily in the control of the cutting and swinging and depending upon vacuum and pressure gauges and electrical meters for information as to what is going on inside his rather complicated and sometimes temperamental machine.

Many hydraulic dredges will operate satisfactorily on one job and get into difficulties on another because of failure to understand and put into practice the basic principles of excavating and pumping a mixture of dirt and water under constant varying conditions. Our further efforts should be directed towards providing the operators with better instruments and devices for the control and more efficient use of the available cutter drive and pumping power.

Dredge Output

The output of a hydraulic dredge (see "Hydraulic Dredge Output,"

Continued on page 40



Builds *85 bridges in 1 year* with mobile clam-pile driver

Hal Parker, County Engineer, Clinton, Mo., saw an opportunity early last year to cut costs by mechanizing Henry County's Bridge Dept. with a low-cost Bantam clamshell on rubber tires. Parker used fast-working Bantam clam to dig foundations . . . switched to 1200 lb. hammer for driving piling . . . employed rugged 30' boom for pouring concrete buckets weighing 750 lbs. per load. This new Bantam method enabled Parker to service 750 sq. mi. of roadways . . . complete 85 small bridges in 12 months at record low cost.

Keeps going 2400 hours *—without repairs!*

Despite gruelling work schedule of 8 hrs. a day, 6 days a week, only Bantam maintenance has been for cable replacement, according to Engineer Parker. You, too, can cut costs with Bantams. Act now!

Clip . . . Mail today!

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☐ Shovel ($6195)* ☐ Hoe ($6040)* ☐ Pile Driver ($6110)* ☐ Crane ($5520)* ☐ Dragline ($5940)* ☐ Clamshell ($6080)*

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Company

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*Less truck, F.O.B. Waverly, Iowa. Prices subject to change without notice.

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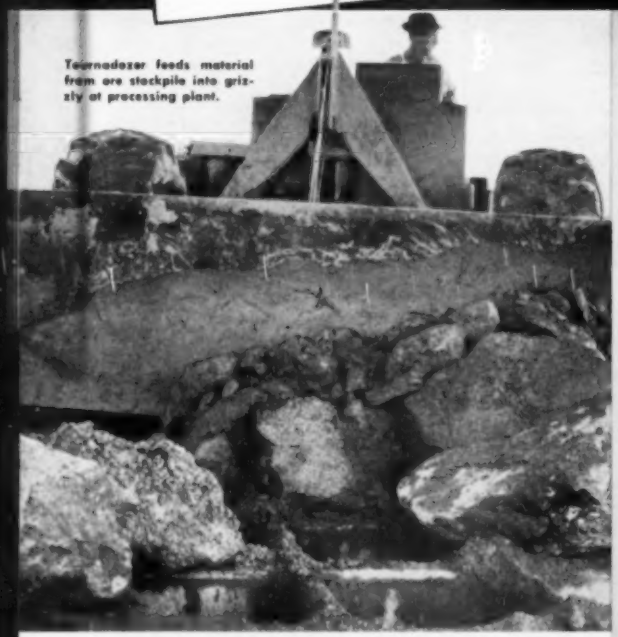
Costs less . . . goes anywhere fast

GETS MORE JOBS DONE

Arkansas Aluminum Plant on 5 JOBS with

1. Dozes bauxite ore into grizzly
2. Pulls gyp wagon, plant to dump
3. Spreads waste material at dump
4. Maintains quarry rock stockpile
5. Cleans around two 2½ yd. shovels



Tournadozer feeds material from ore stockpile into grizzly at processing plant.

Near Little Rock, Arkansas,

a large Eastern manufacturing firm operates an ore pit and processing plant 24 hours a day. They are mining bauxite rock, which must be crushed, then processed to recover aluminum ore. On this multi-handling operation, they have the problem of doing a lot of widely-scattered dozer jobs within very short periods of time . . . and have found the answer in a 19 m.p.h., rubber-tired C Tournadozer. "This *one* LeTourneau machine has been doing the work of *two* crawlers on our operation," reports the Plant Superintendent.

Tournadozer's principal job during its regular 12-hour work schedule is dozing quarry rock into 4 to 8 grizzlies. It utilizes the previous waiting periods to handle waste disposal . . . pulling a 13-yd. bottom-dump wagon ½ mile from gyp conveyor to dump area . . . spreading the material . . . then returning ½ mile to conveyor, where wagon is uncoupled and reloaded while Tournadozer "lends a hand" on other odd-lot, maintenance-type jobs.

Mail to: R. G. LeTOURNEAU, INC., Peoria, Illinois

LeTOURNEAU LET EQUIPMENT

NAME.....

TITLE.....

COMPANY.....

STREET.....

CITY, STATE.....

Please send information on

- ☐ 180 h.p., 19 m.p.h. C Tournadozer
- ☐ 122 h.p., 19 m.p.h. D Tournadozer

for use with:

- ☐ Bulldozer
- ☐ Carryall
- ☐ Angledozer
- ☐ Rooter
- ☐ Snow Plow
- ☐ Other Drawn Equipment
- ☐ Side Crane

doubles crawler output

C TOURNADOZER

Dozing over end of dump, big 4-wheel air brakes stop Tournadozer instantly . . . operator simply moves gear selector lever to get high-speed reverse which cuts "deadhead" return time to a minimum.

In addition, Tournadozer is on call 24 hours a day to level quarry rock stockpile . . . and to clean around 2 electric 2½-yd. shovels working inside storage sheds. In an average 24-hour period, the "C" travels between 30 and 35 miles, part of the distance over pavement, part cross-country . . . crosses railroad tracks and curbs without planking . . . works frequently on concrete without damage to surface or to tires.

On all five of these major dozing and pulling assignments, the versatile Tournadozer consistently outproduces crawler-type tractors. Its fast, "runabout" ability has helped maintain steady, balanced production of pit and plant at all times.

With Tournadozer's 19 m.p.h. forward and 8 m.p.h. reverse speeds, you, too, can do more jobs, and get more work done at a lower cost per job. Let your LeTourneau Distributor show you more job-proved facts and figures. Why not write, or call him . . . TODAY!

Loaded with waste material from ore process conveyor, wagon is quickly coupled to Tournadozer for ½-mile haul to dump area.

Tournadozer's 4-wheel drive on giant 21.00 x 25 tires gives rig plenty of power for pulling the 13-yd. wagon.

As waste material is dumped, high-speed C Tournadozer spreads previous load with its electric-control 2½-yd. bulldozer blade

Tournadozer, Angledozer, Carryall, Rooter—Trademark Reg. U.S. Pat. Off. M27

LETOURNEAU PEORIA, ILLINOIS — JOB-PROVED The World Over — **TOURNADOZERS**

IT'S RUBBER THAT PUTS THE ACTION IN TRACTION

Continued from page 30

proved the network. The State Engineers have 23 Allis-Chalmers, Caterpillar and Adams motor graders, 29 Allis-Chalmers and Caterpillar bulldozers, seven International tractors with Bucyrus-Erie Dozer Shovels, three Athey Overhead loaders, and 22 shovels and draglines.

Montana-Idaho Dam OK'd

A measure authorizing impounding of water in Montana for use in Idaho gained momentum Jan. 25 when Gov. John W. Bonner signed Montana enabling legislation for the Washington Water Power Company's $35 million Cabinet Gorge hydroelectric project in Idaho.

The company has Federal Power Commission authority to build a dam in the Clark Fork of the Columbia River, one-half mile from the Montana-Idaho border. It would back up the river into Montana for about 20 miles.

Strip with Loader

Every 40 seconds, a heavily-laden truck recently pulled out of the borrow pit of a highway project near Kentland, Ind. This is the production rate set by

Moellering Construction Co. of Fort Wayne, as they stripped overburden from a stone deposit and used the sticky sandy-clay material for fill dirt.

A Domor elevating grader on a Caterpillar No. 12 motor grader handled the loading chores. The unit heaped 440 loads a day into 35 trucks of various capacities. The new road will provide a modern by-pass for the town of Kentland.

Issue Report on Mine Pumps

The U. S. Bureau of Mines has issued a report on the design of centrifugal pumps that have proved successful in mine pumping. However, it is noted that there are several types of these pumps and that when a mine-pumping problem is contemplated an engineering study of the hydraulic conditions under which the pumps are to operate is imperative.

The report also cautions that tests should be made to determine the corrosive action of the mine water, since this dictates the kind of metal that should be used in the pump parts.

Included in the report are descriptions of centrifugal mine pumps made by manufacturers specializing in this type of equipment, drawings of pumps, and operating features.

A copy of the publication, *Report of Investigations 4749, Centrifugal Pump Installations in Anthracite Mines of Pennsylvania*, can be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

Magnet Recovers Scrap Iron

The grass-covered hills of slag near Coatesville, Pa., contain waste and quantities of scrap skimmed from cooking metal in nearby mills over the last half century. The scrap metal is being recovered by a magnetic crane.

One of the five slag hills in the vicinity being worked by Brown Brothers Construction Co., Inc., of Coatesville, is estimated to contain 6 million cubic yards of scrap iron. As much as 3,500 tons have been recovered in a single month. In this operation the company virtually picks up the slag hill and sets it down again after recovering the metal.

The hill is first dug into by a Koehring 1½-yd. shovel which loads the slag onto Koehring Dumptors. Their loads are dumped at a higher level a quarter of a mile away. At this point a Lorain crane equipped with a magnet powered by the General Motors diesel engine separates the scrap iron from the slag. The scrap is hauled to the mill and the operation is completed when an Allis-Chalmers tractor levels off the residue.

More Profit Per Cast
That's one of the big reasons for Omaha Dragline Buckets being used by successful contractors, everywhere — from border to border and coast to coast. There is an Omaha Dragline Bucket to meet your specifications. Write today for catalog giving complete information!
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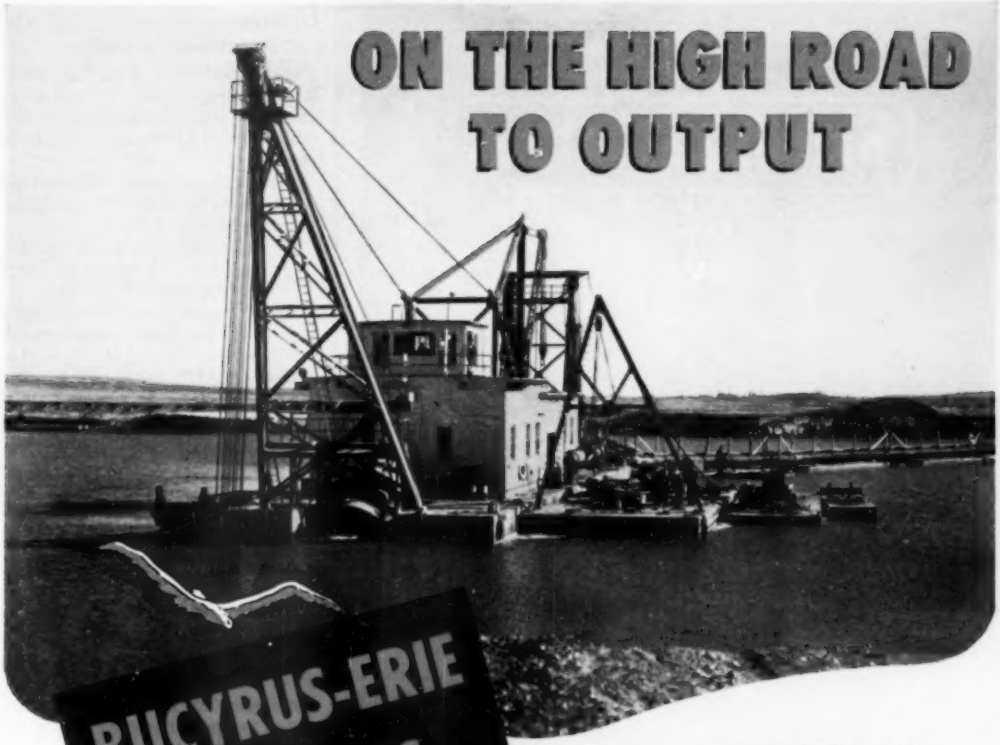
DRAGLINE BUCKETS
DRAKE-WILLIAMS-MOUNT • OMAHA, NEBR.

ON THE HIGH ROAD TO OUTPUT



YOU'LL be heading for profits when you select Bucyrus-Erie to build your dredge. Here's why:

MASTERS OF DREDGE DESIGN. Your Bucyrus-Erie dredge is designed for its work. Job requirements are thoroughly investigated beforehand. A few of the many considerations given careful attention are: wanted output; maximum and minimum digging depths below water level; prevailing marine or fresh-water conditions; types of material to be handled; shortest and longest discharge lines needed; kind of fuel or power available. Guided by a complete analysis, and backed by long experience, Bucyrus-Erie engineers give you the "years ahead" design that means big output on a long-term, economical basis.

FINEST MATERIALS. From Bucyrus-Erie's laboratory come the special steels and the on-the-spot control that assure the continued high quality of castings produced in the company's steel foundries. The work of the flame-hardening and heat-treating shops receives the same constant laboratory control. Result: your Bucyrus-Erie dredge is made of the very finest in materials.

SUPERIOR CRAFTSMANSHIP. In Bucyrus-Erie's own machine, forge and erecting shops, shop men skilled in years of dredge building know-how make sure that the finished machinery will live up to its design.

Your best guarantee of a successful dredge is the selection of Bucyrus-Erie Company as its builder.

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN

310900

Preferred power for portable grinders and a wide range of other equipment for railroad maintenance — the world's most widely used single-cylinder gasoline engines on machines and tools for industry, construction, railroads, oil fields, etc., and on appliances and equipment for farm and home.

ONLY Briggs & Stratton can give you the benefits of more than 30 years of air-cooled power experience — gained in the production of more than 5,000,000 single-cylinder, 4-cycle, air-cooled gasoline engines.

Briggs & Stratton Corporation, Milwaukee 1, Wis., U.S.A.

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

Dredges

Continued from page 35

EXCAVATING ENGINEER for July, 1950) is the most difficult to predict of all excavating machines and is most seriously affected by changes in material because:

(a) Available power (vacuum) for delivering material to the pump is limited.

(b) Transportation power requirements vary greatly with different materials.

(c) Transportation power varies with length of pipeline and elevation.

Good judgment in selecting the correctly powered dredge for the job and skilled operating personnel to handle it will provide an efficient operation where conditions are suitable for hydraulic dredging and do the work more economically than any other combination type of excavating and transporting equipment.

The general preference at the present time is for diesel powered dredges up to a point where it is practical to drive the main dredging pump directly from a single diesel engine (maximum about 1,600 hp) and to provide a diesel generator set to supply electric power for the cutter drive, winch and auxiliaries. Beyond the power range of the single diesel engine pump drive the full diesel electric dredge is an excellent arrangement but it is quite expensive. The tendency for the larger and more powerful dredges has, therefore, been towards the steam oil burning power plant with a geared turbine driving the main pump and a turbogenerator set supplying electric power for the auxiliaries. This type of dredge requires less initial investment than the diesel electric but is not as economical to operate.

Straight electric dredges may be used to advantage where shore power supply is available at reasonable cost.

U. S. Dredges — Prewar

In 1940, as part of the defense preparations, the Atlantic Gulf and Pacific Co. compiled a list of the large cutterhead hydraulic pipeline dredges in the United States. There were then 57 dredges ranging in size from 18 inches to 30 inches with individual pumping power from 1,500 hp to 5,000 hp; a total pumping power of 148,650 hp; an average of 2,610 hp per dredge.

Dredge building during the war was practically non-existent; the only one

of any size being a rather special 20-in. electric, in 1942, for recovering copper tailings from Lake Linden, Mich. The 28-in., 5,000-hp steam turbine dredge *Mindi* was purchased by the Panama Canal early in 1941 and started operating at the Canal in 1943.

When Guam was recaptured and became the base of operations for our Pacific Fleet, the Navy Bureau of Yards and Docks immediately started an intensive dredging program around Port Apra for the development of harbor facilities and land reclamation. Six large dredges were acquired in the U. S., transferred to Guam and put to work with the orders: "If the islands aren't large enough the Seabees will make them bigger."

Mud, sand, clay, soft and hard coral rock poured from the pipelines of these dredges manned by crews of Seabees night and day until the end of the war. Acres and acres of new land were made and harbor works were constructed. This work continued after the war through 1948, with civilian crews on the dredges until completion of the development program. The Navy still owns the *Norfolk* now located at Mare Island, Calif., and available for maintenance work; the *Indiana* was sunk; the *Gulfstream* has been transferred to the Army for use in the Pacific; the other three dredges were declared surplus and sold to private contractors.

The Pacific Dredging Fleet consisted of:

Name	Size	Type of Power Plant	Former Owner	Navy Iden.
Indiana	30-in.	Steam Turbines	Great Lakes Dredge & Dock	YM-18
Tualatin	30-in.	Steam Turbines	Hydraulic Dredging Co.	YM-19
Gulfstream	28-in.	Steam Turbines	McWilliams Dredging Co.	YM-20
New Jersey	30-in.	Diesel Electric	Great Lakes Dredge & Dock	YM-21
Norfolk	24-in.	Diesel Electric	Atlantic Gulf & Pacific Co.	YM-22
Harris	27-in.	Electric	American Dredging Co.	YM-23

The greater share of the large dredging projects are government financed and probably due to the urgent need for completing other types of construction work there has been a lack of definite prospects for new dredging work resulting in a limited activity in new dredge construction. However, there have been a few important additions to the fleet.

McWilliams Dredging Co. built two powerful 28-in. steam turbine dredges, one of which was sold to the Argentine. American Dredging Co. built the 3,500 hp 27-in. steam turbine dredge *Philadelphia* and Atlantic Gulf and Pacific Co. one of about the same size, which was towed to the Argentine. A 20-in. 2,000 hp diesel dredge was built by R. C. Hoffman Construction Co. and sold to the Dominican Republic. A 24-in. high powered diesel-electric built by Puget Sound Bridge & Dredging Co., Seattle, has a 2,500 hp pump and a 4,000 hp power plant. A rather special 18-in. diesel dredge was built for the U. S. Reclamation Service for operation on the Colorado River near Needles, Calif. A number of smaller dredges have been built for operating in the United States and various loca-

WELLMAN *Williams Type*

FAST BUCKET OPENING SPEEDS OPERATIONS

• Double-hinge construction on Wellman's multiple-rope bucket permits faster opening than a single hinge. This speeds up operations, also gives a bigger spread in the open bucket for the same headroom.

Wellman's welded-design buckets offer you better performance and longer service. In all types and sizes you'll do better with Wellman!

Want Facts?

Write for free descriptive bulletins.

CLAMSHELL • DRAGLINE
CUSTOM-BUILT BUCKETS
STONE AND WOOD GRABS

THE WELLMAN ENGINEERING COMPANY
7000 Central Avenue
Cleveland 4, Ohio

tions throughout South America.

The 30-in. dredge *New Jersey* built in 1927 was at that time, and still is, the most powerful diesel electric hydraulic dredge in existence. The power plant developed a total of 5,000 hp, using 3,000 hp on the main dredging pump and 600 hp to 1,100 hp for the cutter drive. This dredge will dig 60 feet below water and has spuds 48 inches by 85 feet weighing 57 tons.

The type of variable speed and torque control used for the main pump, cutter drive and winch compares favorably with any in use today and within the limitation of its pumping power the *New Jersey* is still a first line dredge, and proved it in heavy coral rock work at Guam during the war. The power supply is constant voltage direct current. Variable speed control for the main pump motor from 250 to 375 rpm is obtained by motor field regulation, accomplished by means of a motor operated rheostat actuated by push buttons at the dredge operator's position. The motor is brought up to basic operating speed by means of a resistor in series with the motor armature. This combination provides a constant horsepower variable speed drive.

The cutter motor has a 600-hp normal rating with a peak load rating of 1,100 hp for one minute. The control provides starting by armature resistance and speed control by means of motor field regulation. The motor has two separate armatures and the control connects them either in series of parallel, providing constant horsepower variable speed from ½ power and ½ normal speed to 200% power and speed. The swinging winch is full Ward Leonard control.

Dredge *Indiana*

The 30-in. steam dredge *Indiana* became famous as a world traveler. It was built in 1912 for the Port of Portland, Ore., with a 1,500-hp triple expansion engine on the main dredging pump. After pumping millions of yards of dirt along the Columbia River it was purchased in 1933 by Great Lakes Dredge & Dock Co. and towed all the way down the Pacific Coast through the Panama Canal, up the East Coast and through the St. Lawrence and Great Lakes to Manitowoc, Wis., where it was completely reconditioned with the hull, gantries and trusses about the only major parts salvaged. The 34-in. suction, 30-in. discharge, 72-in. impeller pump was driven by a 5,000-hp. turbine at 360 rpm and a 700-hp turbine operated the cutter drive.

This dredge operated on the Great Lakes and Mississippi River for a number of years and at Cameron, La., she pumped her all time record of 93,000 yards of silty sand in 24 hours. In 1941 the *Indiana* moved on to Trinidad to start her war service record at Port of Spain by dredging 12½ million yards of hard coral in spite of submarine attacks within a mile of where she was working.

The dredge was purchased by the Navy in 1943, renamed the YM-18, left Trinidad for Hawaii and from there to Guam where approximately one-third of the new acreage came through her pipeline. Digging mostly heavy abrasive coral sand (3,400 pounds per yard), she set a record of 53,000 yards in 20 hours. Normal pipeline pressure was about 100 psi, but 120 to 125 psi was reached on 6,000 feet of line and 16-ft. lift. Her honorable career came to sudden end during the hurricane in 1946 when she was sunk at Okinawa.

Dredge *U. S. Mindi*

This 28-in. steam turbine driven dredge is the latest addition to the

Continued on page 46

JAHN Heavy Duty TRAILERS

FROM 5 TONS TO 100—

YOU CAN DEPEND ON THESE HEAVY DUTY FEATURES

- Easily loaded
- Extra strong gooseneck
- Rigid cross-bracing
- Electrically welded

WHETHER your load weighs 5 tons or 100, you can depend on a Jahn Trailer for fast, safe transportation to your next job. They're famous for the rugged construction that means strength and stamina under the toughest conditions. Smooth, reliable, equalized brakes provide that extra margin of safety.

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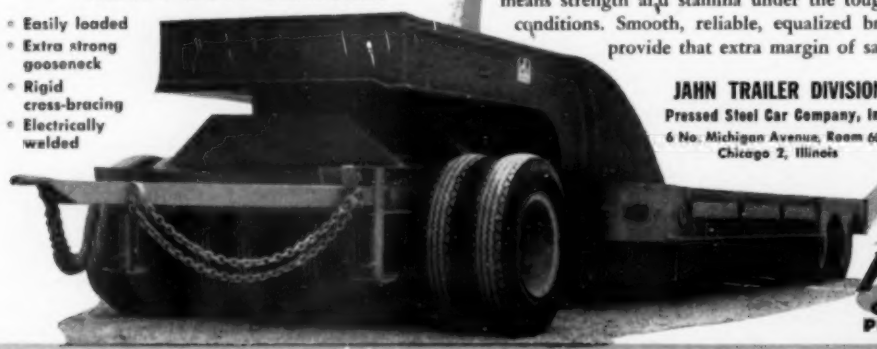


PSC QUALITY PRODUCTS

THERE'S A JAHN TRAILER FOR EVERY HAULING NEED

Tandem Axle Trailers

Single Axle Tilt Trailers

Single Axle Trailers

SNOW REMOVED AT THE RATE OF 150 YARDS PER HOUR in Galena's business section. Operation included windrowing snow with grader blade, then loading into trucks with rear-end loader. Parking facilities were quickly restored. V-type snowplow was used on the Model D to open outlying roads.

HOW TO GET *More Mileage* FROM YOUR *Road Maintenance Dollar*

USE THE ALL-AROUND, LOW-COST ALLIS-CHALMERS MODEL D MOTOR GRADER—

ONE WEEK'S GRADING IN ONE DAY. The Model D does more grading in a single day for Galena than the old tractor and towed grader did with two men in one week.

Produces at Both Ends... As Well as in the Middle

One man handles the work of a crew with the low-cost Model D! Does a better grading job with tandem drive and other big grader features . . . and is an all-year, all-around outfit with easily attached accessories.

In Galena, Ill., for example, a Model D with loader, scarifier and snowplow attachments speeded all phases of road maintenance, snow removal and material handling . . . *and decreased manpower requirements for these jobs by more than 40 percent!* That's cutting labor costs almost in half.

Like Galena, you can get more mileage from *your* road maintenance dollar with the versatile Model D. Let your Allis-Chalmers dealer prove it . . . NOW!

WORKS ON STEEP GRADES—WINTER AND SUMMER. Many grades are more than 22 percent in Galena's hilly terrain. Tandem drive and rear-engine design give the Model D ample power and traction to work these steep grades the year around—dozing, ditching, plowing snow.

Some of the Easily Mounted Attachments that Make the Model D the Most Useful, All-Around Grader on the Market Today

REAR-END LOADER. Hydraulically operated, ⅜ cu. yd. bucket . . . available with bucket teeth.

V OR BLADE-TYPE SNOWPLOWS. Interchangeable, hydraulically operated. Blade plow may also be used for backfilling and light 'dozing.

SCARIFIER MOUNTS behind grader blade . . . makes full use of weight and traction . . . steering is much easier.

WINDROW ELIMINATOR. Saves extra passes by feathering out windrows.

Also: All-View cab — easy to remove and replace . . . heavy-duty front tires and other special accessories.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

NOT in the *Contract*

Little boy watching milkman's horses: "Mister, I'll bet you ain't gonna get home with your wagon."

Milkman: "Why?"

Little Boy: "Cause your horse just lost all of his gasoline."

Supt.: Hey, don't spit on the floor.

Shovel runner: 'Smatter, does it leak?

The girl on the bus was reading about birth and death statistics. Suddenly she turned to a male beside her and said, "Do you know that every time I breathe a man dies?"

"Very interesting," he returned, "why don't you try Sen-Sen?"

A. Model: "What did that artist say when you asked for a job to pose?"

B. Model: "He said, 'I can't afford a model just now, but I'll bare you in mind.' "

"What do you think of these two candidates?"

"Well, thank goodness only one will be elected."

He: "What do you do with your step-ins when you wear them out?"

She: "I wear them back."

A grave digger, absorbed in his thoughts, dug the grave so deep he couldn't get out.

Came nightfall and the evening chill, his predicament became more and more uncomfortable. He shouted for help and at last attracted the attention of a drunk.

"Get me out of here," he shouted. "I'm cold."

The drunk looked into the grave and finally distinguished the form of the uncomfortable grave digger.

"No wonder you're cold," he said. "You haven't got any dirt on you."

"Ugh, me lik'um white man's idea. Now chief no have to move teepee all time."

The burlesque queen woke up in jail to find herself fully clothed. "Help! Help!" she screamed, "I've been draped."

The doctor met Mrs. O'Hoolihan at the door. "Did you take your husband's temperature as I told you? And how is he?"

"I did that, you know, Doctor. I borrowed a barometer and placed it on his chest. It read Very Dry so I rushed out and brought him a barrel of beer. He's gone back to work today!"

A man stood on the street corner waiting to cross while traffic screamed by, swift and continuous. After a long wait, the man became impatient, but he dared not risk going out into the traffic. He spied another man on the other side of the street and called to him: "I say, how did you get over there?"

The other man cupped his hands about his mouth and shouted: "I was born over here!"

He: "Will you marry me?"
Heiress: "No, I'm afraid not."
He: "Oh, come on, be a support."

Two men were working on the White House lawn, each supplied with a small push cart upon which was a garbage can. They walked about picking up papers with a long spear. One spied a piece of tissue and started to spear it, when suddenly a gust of wind came up and blew the paper into the White House through an open window.

The man became frantic and rushed into the building. He returned shortly after and said: "I was too late. He had already signed it."

A young lady with a touch of hay fever, took with her to a dinner party two handkerchiefs, one of which she stuck in her bosom. At dinner she began rummaging to the right and left in her bosom for the fresh handkerchief. Engrossed in her search, she suddenly realized that conversation had ceased and people were watching her fascinatedly.

In confusion she murmured, "I KNOW I had two when I came in."

"CAT" BULLDOZER...

America's all-purpose tool!

Owned by John H. McCosker, Inc., Berkeley, Calif., this "Cat" D8 Tractor with No. 85 'Dozer clears and removes dirt from landslide caused by heavy rains in Oakland, California. Mr. McCosker says of this tool: "One of the finest pieces of equipment that money can buy. Low on repairs, get good traction, and she's easy to handle!" Price of a standard "Caterpillar" D8 Tractor is $15,000; No. 85 Bulldozer, $1,775; No. 25 Cable Control, $1,630, f.o.b. Peoria. Prices subject to change without notice.

THE tool that carved out the streets and leveled building sites is the same "Caterpillar" Bulldozer now protecting the community from landslide hazards. The versatility and long service life of "Cat" 'Dozers make them a prime favorite in the construction field.

These machines give you matched design—tractor and 'dozer are built to work together. This rugged team is a bear at meeting work schedules. Sturdy construction and quality materials enable it to keep punching full time without down-time, and the special steel cutting edge of the blade hammers through the toughest going. Most important of all, the precision methods used in "Caterpillar" factories build extra years of life into these tools.

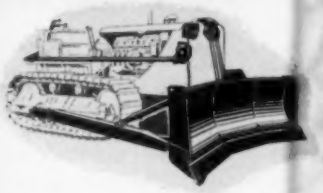
For help with your equipment problems, see your "Caterpillar" dealer *now*. Today's expanding military program has high priority. But it is recognized that our national preparedness depends upon stepped-up civilian production too. We must have more lumber, coal, food and essential ores. We must continue to build and improve America's vital network of highways. So your "Caterpillar" dealer is interested in meeting your needs—through equipment replacement and by exercising his working partnership with you to keep the machinery you have *on the job*.

CATERPILLAR, PEORIA, ILLINOIS

• • •

"CATERPILLAR" BULLDOZER EXTRA FEATURES

1. Tractor and 'dozer *broken to harness*, and a size for every need.
2. Moldboard curvature for active, *rolling*, higher production loads.
3. Box section side arms—extra thick at points of greatest stress.
4. Choice of straight or angling type of blade, simple to maneuver and easy to adjust or detach.
5. Your choice of hydraulic or cable controls.
6. The power of the "Caterpillar" Diesel Engine is geared to blade *capacity*.



New Addition to 'Dozer Line

Here's a specialist that can increase production and cut costs. It's the brand new No. 8U 'Dozer for use with the "Caterpillar" D8 Tractor, with cable control. Working best in loose or light material, the end portions of the blade extend forward like a U, enabling it to drift large loads for longer distances and bigger job production. The versatility of this new tool gives it excellent performance on all kinds of 'dozing jobs, from stockpiling to pioneering.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

Dredges

Continued from page 42

Panama Canal Fleet. The main pump is driven by a 5,000-hp steam turbine, the cutter by a 600-hp motor with provision for momentary 100% overload and the winch machinery by a 200-hp motor, all electric power being supplied from turbo-generator sets. The order for the dredge was placed by the Panama Canal in early 1941 as part of defense preparation. It was completed in June 1942, but because of the necessity for extreme caution, due to the submarine menace, it was January 1943 before delivery was made at the Canal under Navy escort. This dredge has worked in very hard material such as blasted rock, unmined sandstone and coral rock with satisfactory results. The best one day record in softer materials is 83,500 yards in 21 hours. Discharge pressure up to a maximum of 170 psi have been obtained when pumping through 15,000 feet of pipeline. The dredging ladder is 100 feet long and maximum dredging depth is 72 feet.

These two dredges, built for McWilliams Dredging Co. and completed in 1947, are the most powerful cutterhead hydraulic pipeline dredges in existence today. The 34-in. suction, 28-in. discharge dredging pump is driven by a steam turbine having a normal rating of 5,000 hp at 380 rpm and will develop and maintain a 25% overload or 6,250 hp. Impellers up to 88-in. diameter will absorb all of this power. A turbo-generator set supplies electric power for a 1,000-hp normal rated 2,000-hp maximum rated cutter drive motor, a 150-hp motor driven 7-drum winch and auxiliaries.

Ward Leonard control is used on the cutter drive and winch to provide variable speed and torque. It is possible to develop a maximum swing line pull of 90,000 pounds. The oil burning steam power plant is capable of delivering 100,000 pounds of steam per hour at 450 psi and 750° F. The stern of the hull is shaped similar to the bow of a ship for towing on long trips and quarters are provided for 75 men.

Fort Peck Dam Dredging

The Fort Peck earthfill dam built by the U. S. Army Engineers was the largest single hydraulic dredging construction job. The first of four dredges started pumping in October 1934 and when the fill was completed at the end of 1939 approximately 156 million yards of sand, borrow pit measurement, had been pumped, of which 126 million yards remained in the fill. Four 28-in. straight electric dredges were built especially for this project, each equipped with two 2,500-hp pumps operating in series, a 700-hp cutter drive and a 150-hp winch. Each dredge had a supplementary floating booster plant with two 2,500-hp pumps and a land booster with one 2,500-hp pump. Each pump developed about 65 pounds pressure. During the later stages of construction 10 pumps with a total of 25,000 hp operated in series pumping through 35,000 feet of pipeline and 250 feet elevation. Cumulative pressures up to about 150 psi were developed.

Relief Valve Injects Water

Diaphragms in the discharge line designed to rupture at 300 to 350 psi provided relief from excessive water hammer and back pressure, but the most important contribution for providing a cushion against shock of water hammer and to prevent "slugging" of the pump was the introduction of a relief

CUT DIGGING COSTS

with the new Sherman Power Digger

WRITE FOR LITERATURE TODAY!

Patented, actuated bucket gives you selective digging action, better loading, greater versatility.

All-hydraulic action—made possible by heavy-duty hydraulic cylinders—assures efficient performance.

SPECIFICATIONS

Shovel reach below ground surface	8 feet
Digger reach behind tractor	10 feet
Swinging arc	140°
Trench width, standard digging shovel, single cut	18 inches
Digging shovel capacity	3.5 cu. feet
Loading shovel capacity	.5 cu. feet
Loading clearance, digging shovel, loaded	7 feet
Loading clearance, loading shovel	10 feet

Standard tractor mounting gives unmatched maneuverability and transportability.

•

Digs ditches, trenches, footings, culverts, basements and other excavations.

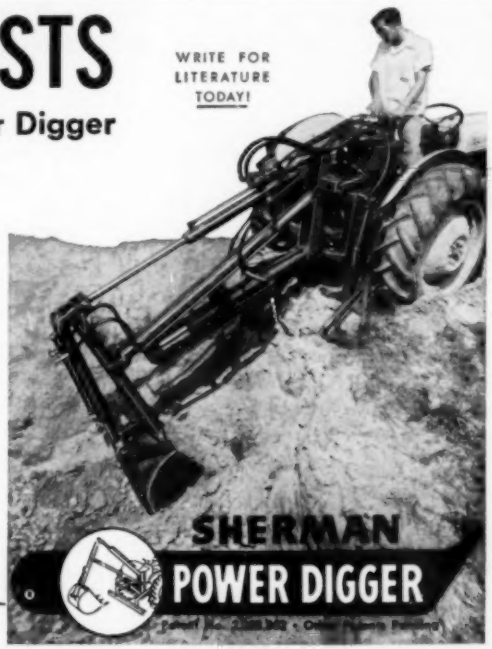
Works well behind the tractor at any angle.

•

Actuated bucket raises high enough to load standard dump truck.

•

Handles roots, rocks, hard clay and oiled road surfaces.



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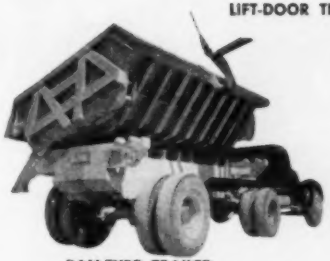
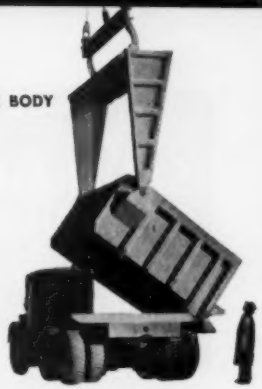
DROP-DOOR CAR



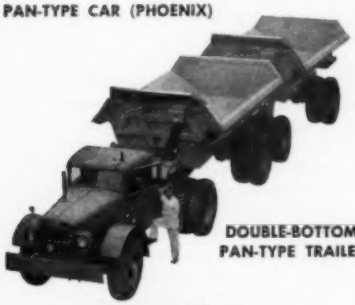
PAN-TYPE TRAILER

LIFT-DOOR TRUCK BODY



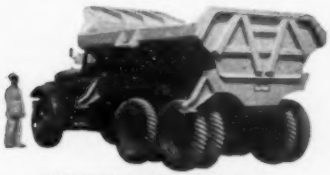
DROP-DOOR TRUCK BODY

PAN-TYPE CAR (PHOENIX)



DOUBLE-BOTTOM PAN-TYPE TRAILER

LIFT-DOOR TRAILER



PAN-TYPE TRUCK BODY

DOUBLE-BOTTOM DROP-DOOR TRAILER

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Do the spectacular advantages of new, modern side-dumps apply to your hauling requirements? Is there an undiscovered opportunity to reduce your handling, increase your production, save hauling time and cut your hauling costs by switching to the *roll up, dump, and roll on* side-dump system?

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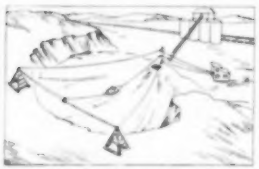
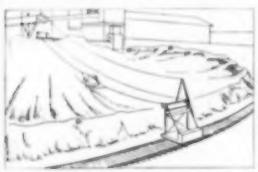
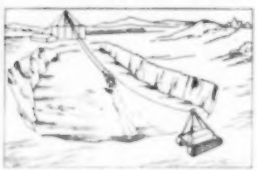


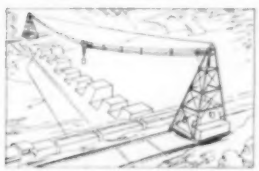
Sauerman Scraper Excavator



Sauerman Scraper Stockpiler



Sauerman Slackline Excavator



Sauerman Tautline Cableway

For more than forty years the main Sauerman business has been the designing and building of cable-operated excavators and conveyors that overcome the difficulties and reduce the costs of moving materials over large areas. Among the best known of these Sauerman machines are the following:

Drag Scraper Excavator — An economical machine for pit and hill excavation, rehandling industrial wastes, cleaning out ponds and general long range earthmoving. It is a powerful excavator and a rapid conveyor.

Drag Scraper Stockpiler — For bulk storage, Sauerman engineers have developed a series of drag scraper machines that make storing and reclaiming an easy one-man job. These machines are giving satisfaction in handling such diverse materials as coal, concrete aggregate, ore, salt, sugar, fertilizers, etc., both indoors and in the open.

Slackline Cableway Excavator — This unique machine has no equal for work that requires digging deep and far and conveying to a high delivery point. In a wet gravel pit, for instance, it reaches under water, comes up with a heaping load of gravel, and lifts its load to the top of the plant, delivering thirty to forty loads an hour.

Tautline Cableway — This is a long range aerial crane designed for all jobs of lifting, conveying and placing loads of unwieldy materials. It is standard equipment for engineering contractors who use it to span the site of a dam, concrete bridge or a similar project and to handle all the materials of construction.

Other Sauerman Machines — Sauerman also builds Tower Excavators and Scraper-Loaders for work requiring machines that move along as they dig; also Power Rakes and Grapples for handling massive materials.

Literature — Tell us which of the above machines interests you and we will send concise, easy-to-read catalogs giving you detailed information.

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valve in the dredge suction pipe below the water line by means of which the operator could quickly feed water to the suction. The material was mostly heavy, sharp, irregular and very abrasive alluvial sand with a small amount of silty clay.

One hundred fifty-four pump assemblies were used on this job and due to the highly abrasive material it was necessary to change a complete pump assembly every one million yards (three to four weeks). The erection crew set up a schedule for installing five pumps in four hours. The average output over the entire job was 1,902 yards per hour; average pipeline velocity 20.3 fps; 16.4% solids; 4.45 kw hours per yard pumped.

Dredging at Kingsley Dam

This was a 30 million-yd. hydraulic fill dam built in 1939 and 1940 with two 30-in. straight electric dredges. The 30-in. pumps had 4,000-hp normal rating, 4,600-hp maximum rating driving motors using up to 78-in. impellers at 350 rpm to develop their full power. The material was similar to that at Fort Peck but with a higher percentage of coarse irregular grain abrasive sand and small gravel, and required a velocity of over 14 fps to even keep it moving. The friction loss at velocities of less than 20 fps was unusually high as the material would not stay in suspension. Twenty-five hundred horsepower booster pumps obtained from Fort Peck were used to complete the work during the final stages of long line pumping with 160-ft. lift. The dredges averaged about 1,600 yards per hour each for the job.

An unusual project in sand pumping for the construction of jetties and a beach near Venice, Calif., was the Elsegundo job. Fourteen million yards of beach sand were pumped through pipelines up to a maximum of 30,000 feet of 28-in. pipe using four 2,500-hp motor-driven pumps in series, averaging one million yards per month and about 17% solids.

Future of Large Dredges

It does seem at the present time as though the 28-in. and 30-in. high power dredges as now built are about as large as general contractors can economically operate due to limitations of auxiliary apparatus previously discussed and available jobs to keep them at work. There will always be unusual projects coming up requiring the de-

velopment of special tools for their economical dredging. For instance, in April, 1948 a Symposium — *Panama Canal — The Sea Level Project* discussed the preliminary designs for a 40-in. steam dredge with a geared turbine-driven pump and turbo-electric auxiliaries to the following general specifications:

Suction Pipe	46-in. diameter
Discharge Pipe	40-in. diameter
Dredging Depth	145 feet
Digging Ladder	200 feet long
Hull	265 ft. long, 60 ft. wide, 20 ft. deep
Power — Main Pump	8,000 hp normal, 10,000 hp maximum, steam turbine and reduction gears.
Auxiliaries	Electrically driven from turbo-generators.
Cutter Motor	2,000 hp to 2,500 hp.
Booster Pumps	8,000 hp — Electric drive at shore stations.

It was proposed to install a booster pump on the digging ladder below water level, to assist the main pump suction in getting the material from 145 feet deep.

This dredge, if and when built, will be the one to end all competition for dredge size and power for some years to come, but it or one of similar size and construction would only be practical for a tremendous government project such as the new Panama Canal.

"Which road does the road commissioner live on?"

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Literature describing remarkable features of the new ROGERS Power-Lift Detachable Gooseneck Trailer will be sent upon your request; but—more than that—any Rogers Dealer will demonstrate its features, right on your own desk with an *operating scale model.*

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Equipment
You Ought to Know About

Gate Loader

Manufacturer: St. Paul Division, Gar Wood Ind. Inc., Minneapolis 14, Minn.

Claims: An improved elevated endgate that fits all van, platform or stake body trucks, will raise loads of 2,000 pounds from ground to body level or lower them in a few seconds. Safety to personnel, security to cargo and savings in time and labor costs are the benefits to the owner of the device.

Explosive Container

Manufacturer: Dravo Corp., Pittsburgh 25, Pa.

Claims: Large amounts of explosive can be stored near blasting sites and protected against pilferage, by use of two big welded steel shipping containers. The 275-cu. ft. boxes with a weight capacity of six tons are ideal for dynamite storage and tool cribs because they can be transported by barge, ship, railroad car or truck. Equipped with skids, they can be dragged by tractors. Lifting rings are provided on the top for moving them with a crane. The doors are fitted with locks.

To minimize the hazard of sparks from contact of shoe nails or tools with the metal floor and walls, the dynamite containers can be lined with 1-in. sheathing. This also acts as a barrier to lessen the impact of stray bullets in hunting areas. The boxes are weathertight and can be stored in the open.

Small Hauler

Manufacturer: American Conveyor Co., Chicago 7, Ill.

Claims: The 3-wheeled Speedbarrow does the work of four standard wheel barrows. Has pneumatic tires, is well balanced for easy handling. Loaded from top, the trip bar can be stepped on to open discharge gate. Length, 42 inches; depth, 36 inches; width, 21 inches; the body has a capacity of 12 cubic feet or 1,800 pounds of material.

Anti-Rust Paint

Manufacturer: Speco, Inc., Cleveland 9, Ohio.

Claims: Paints are available in clear, black and aluminum. They possess all of the penetrating and sealing qualities of standard Rustrem which has been used for many years by industry. In addition they contain liberal quantities of chromate pigment which, is in itself, rust inhibitive. It will stand up longer under extreme conditions of temperature and moisture than any previously available anti-rust paint. Like standard Rustrem, the chromated product can be applied right over rust without wire brushing or scraping. No primer is required. It is suitable for both interior and exterior use.

Portable Compressor

Manufacturer: Ingersoll-Rand Co., Phillipsburg, N. J.

Claims: A large size portable air compressor with rotary type compressor is designated as the Gyro-Flow 600. It delivers 600 actual cfm free air at 100 psi. Total weight is only 9,500 pounds ready for use, making it the lightest weight portable compressor in its capacity range.

The compressor is an advanced-design, two-stage, oil-cooled rotating-vane compressor. It eliminates pistons, con rods, valves, and the need for a clutch. Air is discharged at less than 200° F under normal operating conditions. This, together with thorough oil separation, reduces hose deterioration which is caused by heat and oil.

The 600 is driven by the nationally known General Motors Series 71 diesel engine. It is a thoroughly proven 6-cylinder, 2-cycle engine with 12-volt battery starting and a fast-starting ether system for cold weather operation. "Uniflow scavenging" assures complete combustion at all speeds and cools valves, pistons, cylinder liners and heads.

Warning Light

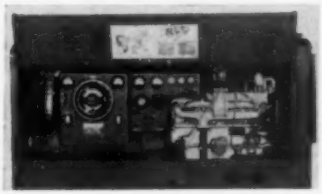
Manufacturer: Light Products, Inc., Beverly Hills, Calif.

Claims: Warning light suitable for trucks, construction jobs and municipalities will run on a single small 6-volt battery for 1,200 hours. The Neo-Flasher is weatherproof, vaporproof, shock resistant, lightweight and produces a brilliant, sharp red flash at ½-second intervals. Cost of operation is approximately one cent per night.

It is constructed of sheet steel and is ruggedly built throughout of quality materials. A 6-volt, dry cell battery, designed specifically for Light Products, Inc., furnishes power to light the neon tube which is the source of light. To prevent theft, specially constructed clips are available so that the light may be locked onto a truck, barricade, or any other object where warning illumination is desired. The intensity of the light is so great that it is clearly visible for more than 2,500 feet. The light is

available in two models; one model with a 360° plastic lens which casts a warning light in all directions, the other model with a 5-in. directional reflector head which is visible for 2 miles.

Arc Welder



Manufacturer: Hobart Brothers Co., Troy, Ohio.

Claims: Arc welders and power generator is a self-contained unit, powered by a 6-cylinder self-starting Chrysler industrial engine directly connected to the welding generator and mounted on a welded steel frame. An auxiliary 3-kw power generator provides power for lights and tools. The unit is completely enclosed by a sheet metal canopy that is bolted directly to the frame. Hinged side doors provide access to the control panels, the engine, the welding generator and other parts within the canopy.

The engine is a Chrysler 6-cylinder, 4-cycle, 1,500-rpm, water-cooled engine developing approximately 53.5 hp at 1,500 rpm and is directly connected to the welding generator by a flexible coupling. It is equipped with an electric starting motor, battery charging generator, battery charging generator voltage regulator, oil bath air cleaner, oil filter, mechanical fuel pump and gasoline strainer. The engine speed is controlled by a mechanical type governor.

The welding generator is rated at 40-volts, 300 amperes under one hour resistance load at 1,500 rpm and has a current range from 50 to 400 amperes.

Air-Cooled Diesels

Manufacturer: Armstrong - Siddeley Motors Ltd., Coventry, England.

Claims: Single-Cylinder model developing 8 hp at 1,500 rpm and two-cylinder model developing 20 hp at 1,800 rpm have bore and stroke dimensions of 4¼ by 4¼ inches. The two-cylinder 20-hp engine represents the highest-powered air-cooled diesel ever sold in the U. S. A. The Armstrong-Siddeley diesels are particularly well suited to generator service developing from 3 to 10 kw. Both models may be furnished with standard S.A.E. bell housing mounted on the flywheel cowl

Continued on page 58

Better Lighting For Your Work With This Rugged STURDILITE

HEAVY-DUTY FLOOD LAMP

BUILT TO TAKE IT — Specially designed for extra efficient, long-lasting service on —

SHOVELS-EXCAVATORS-DRAGLINES-ROAD BUILDING EQUIPMENT-LOCOMOTIVE CRANES-TRACTORS

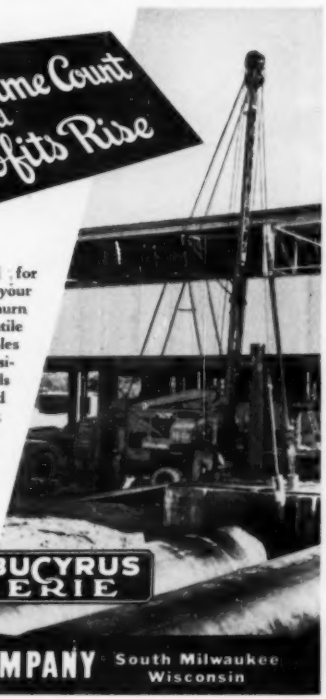
Extra high light intensity and spread from sealed-beam unit. Entire assembly mounted on rubber cushioned base to absorb vibration and shocks. Fully proved by years of trouble-free service. Available in 6-8; 12-16; 24-28; and 110-120 voltages.

ILLUSTRATED BULLETIN, detailed specifications, and prices sent upon request.

PHOENIX PRODUCTS CO. *Metal Spinning Div.*

4723 N. 27th Street — Milwaukee 16, Wis.

Make Your Time Count and Your Profits Rise



There's no need for expensive non-operating time to eat up your profits when you have a Bucyrus-Erie churn drill operating 'round the clock. These versatile machines can do double-duty on blast holes or water wells — doubling your income possibilities. Bucyrus-Erie 20-W or 22-W drills make quick work of 4" to 6" blast holes and are available during a lull in blast hole work for rental, contract, or water well jobs. Since they're completely mobile, little time is lost traveling from one type of operation to another.

To make the most of your business dollar, examine all the money-making features of the Bucyrus-Erie 20-W and 22-W. Write now for complete and detailed information!

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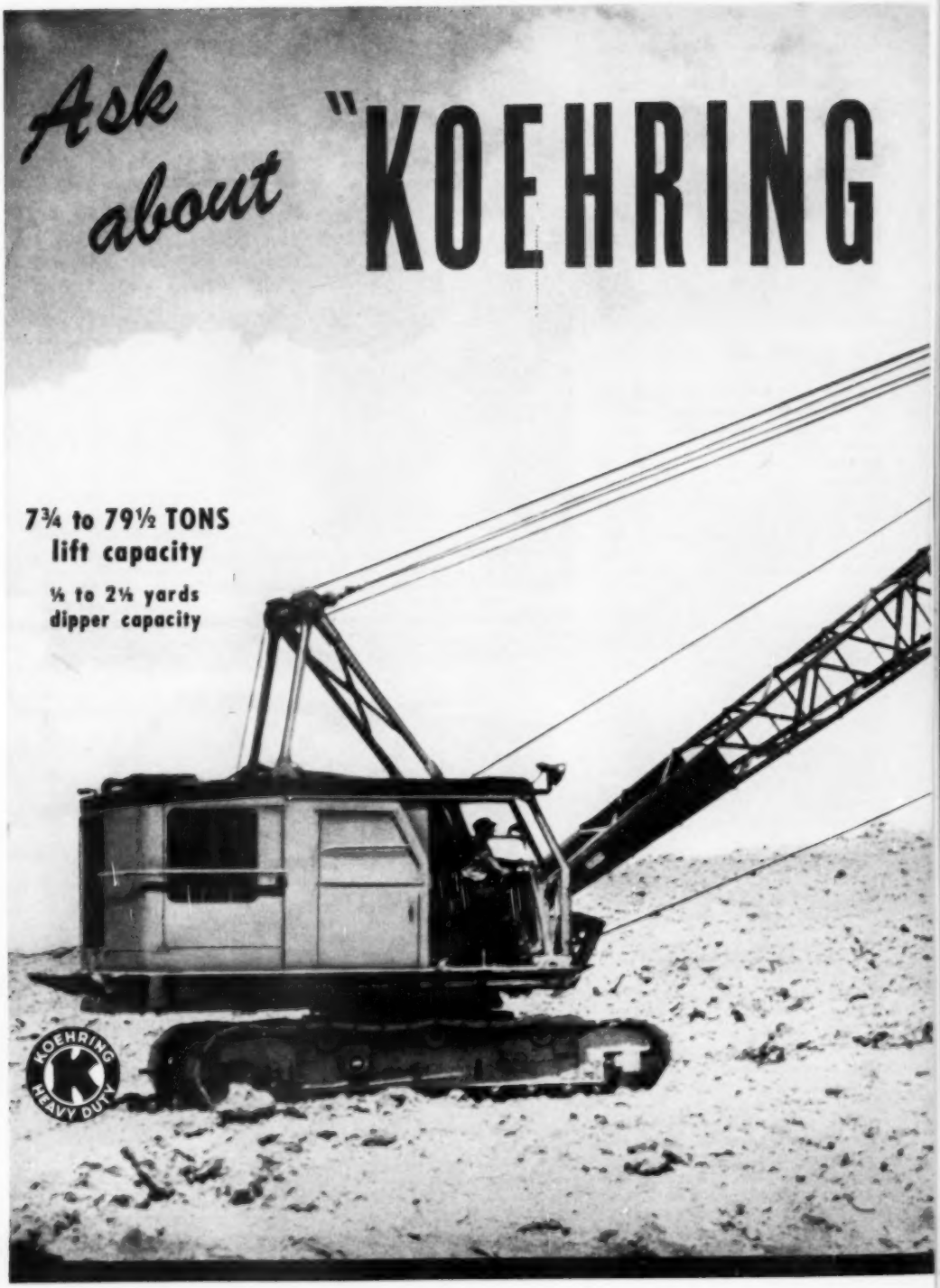

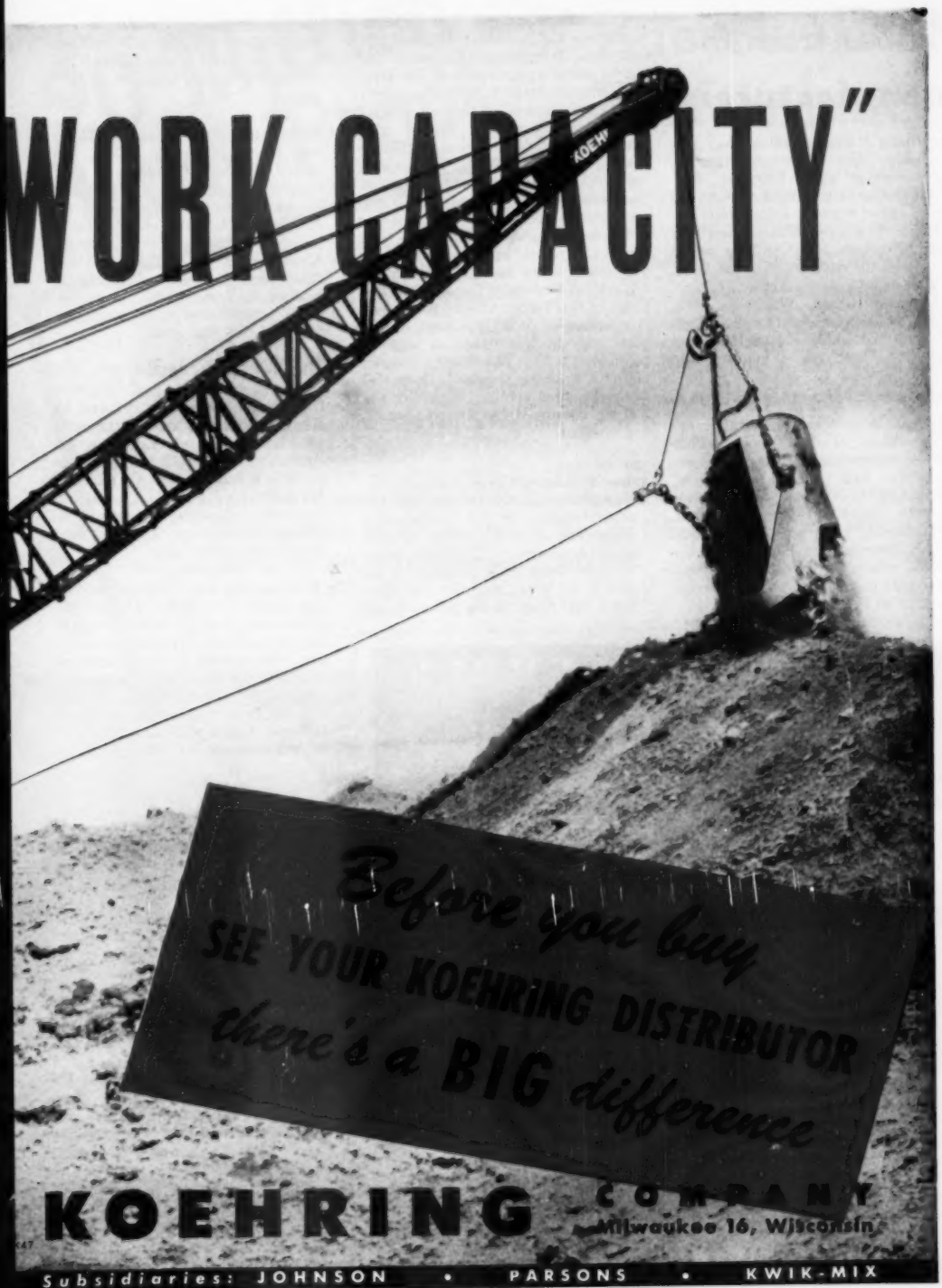
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Notes from the manufacturers

Nordberg Manufacturing Co., Milwaukee, Wis., announces the appointment of Prime-Best, Inc., Milwaukee, as distributor for Nordberg 4FS Diesel engines. Prime-Best, Inc. will cover the southeastern territory of Wisconsin for Nordberg which includes the counties of Green Lake, Walworth, Racine, Kenosha, Dane, Jefferson, Green, Waukesha, Milwaukee, Columbia, Dodge, Washington, Ozaukee, Marquette, Fond du Lac, Sheboygan, Winnebago and Calumet.

Osgood Co. and the General Excavator Co., Marion, Ohio announce the combination of their sales management and policies for the distribution of Osgood and General power shovels, cranes, draglines, clamshells, hoes and mobilcranes. This consolidation affects only the sales efforts, with other functions carried on by the individual companies as heretofore.

Pullman-Standard Car Manufacturing Co., Chicago, Ill., has just completed arrangements to enter the tractor allied equipment field. On Dec. 29, 1950, Pullman-Standard acquired the entire tractor allied equipment business of Isaacson Iron Works. The Isaacson products, now being manufactured at plants in Seattle, Washington and Rockford, Ill., are sold throughout the United States by the same distributors who handle the marketing of International Harvester crawler - type tractors. Foreign sales of such Isaacson products are handled through International Harvester Export Co. The phase of this tractor allied parts activity now carried on at Isaacson's Seattle plant will be transferred as soon as possible to the Hammond, Indiana plant of Pullman-Standard. Operation of the Isaacson plant at Rockford, Ill., will be continued by Pullman-Standard.

Athey Products Corp., Chicago, Ill., has promoted Tom Shea, district representative in 13 northeastern states and eastern Canada, to general sales manager. Mr. Shea began his experience in the construction industry 15 years ago with the Harnischfeger Corp. in the power shovel division. Following the war, he was made district manager in New York for the Le Roi Co. and in 1948 became general sales manager at Milwaukee.

Worthington Pump and Machinery Corp., Harrison, N. J., has named Lloyds Machinery Corp., Capetown, South Africa, distributor of portable air compressors, construction rock drills and air tools. Lloyds will supply Union of South Africa, South-West Africa and the Rhodesias. Worthington has named Hooper Equipment, Inc., Syracuse, N. Y., distributor of construction equipment in that area.

Koehring Co., Milwaukee, Wis., has appointed the American Machine Co., Spokane, Wash., distributor in Washington and Idaho for the complete line of heavy-duty construction equipment along with the products of three subsidiaries, S. C. Johnson, Kwik-Mix and Parsons Companies. American succeeds Western Machinery Co. as the Koehring representative for the area.

B. F. Goodrich Co., Akron, Ohio, has appointed A. Clarke Mack, Jr., sales manager of flat belting, including conveyor, elevator and transmission. He succeeds J. Robert Thompson, who has been appointed manager of the Atlanta district for the division, where he takes the post from Art Coffin who has retired after company service going back 35 years.

Wellman Engineering Co., Cleveland, Ohio, has purchased the property and business of the Anker-Holth Manufacturing Co., Port Huron, Mich. Purchase price was not disclosed. Anker-Holth was established in 1904. The company employs approximately 75 skilled workers for the manufacture of a complete line of hydraulic and air operated cylinders, chucks and collets, air valves and accessories. It will now become the Anker-Holth Division of the Wellman Engineering Co. with headquarters in Port Huron, Mich. J. C. Hodge, executive vice president of Wellman, will supervise the operation of this newly acquired division. Mr. W. L. Komph will continue as manager of sales and engineering and Mr. F. J. Theisen as plant manager.

Wickwire Spencer Steel Div. of Colorado Fuel and Iron Co., NYC, has appointed L. A. Watts assistant general sales manager. Mr.

Continued on page 59

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An improved connecting link that combines safety and simplicity. Its strength exceeds the published strength of comparable alloy chain.

WEDGLOK links can be assembled rapidly on the job—no special equipment required; particularly useful for dragline buckets, slings and other equipment with chain or wire rope attached.

Regular and pear shape. Sizes ⅜" to 3"

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20 Million Yard Proof of Bucyrus-Erie Performance

Consistently high output regardless of weather or ground conditions makes Bucyrus-Erie walking draglines the choice for jobs like this twenty-million-yard channel improvement project in Louisiana.

One important reason is the exclusive Bucyrus-Erie walking mechanism for safe, smooth travel over soft or uneven ground. Others are strong, simple design and construction, assuring reliable performance when working in remote locations, and quickly responding controls for fast, efficient operation.

These outstanding features, backed by Bucyrus-Erie's unmatched manufacturing and engineering experience, add up to top-notch dragline service. The *years ahead* machines in the complete Bucyrus-Erie line provide a size to fit any job.

BUCYRUS ERIE

This 200-W swings a 6-yd. bucket on a 110 boom, works round the clock on Louisiana's Bayou-LaFourche channel improvement project.

Bucyrus-Erie Company • SOUTH MILWAUKEE WISCONSIN

Hot Stuff!

Continued from page 29

lies in these outdoor pits, the slag has a chance to cool from the torrid 2,600 to 2,800° F. at which it leaves the blast furnace.

Slag Watered

But even after a week of the fresh air treatment, the slag bed will be too hot to handle. A tough crust forms across the top of the pit, causing much of the heat to be retained. Sprinkler pipes like those used to water truck farms are laid across the filled-in pit. Watering the slag serves two purposes. It cools the pit further and it also cracks the slag crust, making it easier for the power shovel to dig.

While this pit is being filled, one of the other two pits — previously filled and allowed to cool for a week — is being excavated. A Bucyrus-Erie 120-B electric shovel handles all excavation in the pit. Equipped with General Electric motors and Ward-Leonard control, the shovel has been in operation at Standard's Republic plant since June, 1949.

Although the 120-B is usually a 5-yd. machine, the one in the Standard pit is swinging only a 4-yd. dipper. When the excavator was purchased, Standard was in the process of "feeling out" the larger size machines. Most of their other installations were using smaller capacity shovels. In the change-over to a larger machine, plant officials were not certain how large a dipper was needed to do an efficient job. They more or less tried the 4-yarder out for size. It easily took care of crushing plant capacity as well as slag production and has remained on the machine ever since.

250 Tons Per Hour

The shovel starts at one end of a slag filled pit and digs its way to the other end, loading the material to side-dump gondolas. The excavator moves an average 250 tons per hour during a 10 to 12-hour work day. Digging is not continuous through the working hour; there are frequent waits while the train makes its trip to the crushing and screening plant.

It digs six days a week and a shovel break-down is one of the biggest calamities that can befall a slag pit. The slag keeps on coming from the furnaces whether your shovel is in operating condition or not. For this reason, a large spare parts inventory is carried at all times. Standard is fortunate in having ample pit room where the slag can accumulate on Sundays.

The 120-B in the pit is probably one of the few shovels in the country equipped with a fire siren. Thick clouds of steam constantly rise from the hot slag bed as it is being cooled with the sprinkler lines. Often it is impossible for the locomotive engineer to see any part of the shovel which is loading his train. The shovel operator uses the siren to signal the progress of loading. One short blast means the train should be moved ahead a few feet and a long peal signifies that all cars are filled and the train pulls away.

Tough Digging

The men who work around the pit claim that digging slag is one of the hardest jobs you can assign a shovel. The material is not only hot but exceptionally abrasive. Sometimes it runs into pig iron and salamander, a fused combination of coke, iron and slag. No blasting is employed and the only breakage is achieved by the application of cold water. The larger pieces of pig iron which the operator can see or feel with his shovel are sent back to the blast furnace.

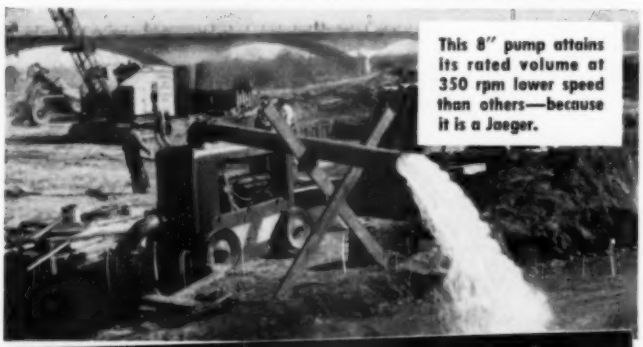
Before being discharged into the hopper alongside the mill, the slag is cooled one last time by a row of sprinklers under which the train passes. This brings the temperature down to a point where it will not scorch conveyor belts in the crushing plant.

Supply Many Sizes

In the Standard mill, slag is crushed and screened to a variety of sizes. About 15 graduations are needed to supply Ohio and Pennsylvania contractors; although the plant is set up to turn out many more sizes.

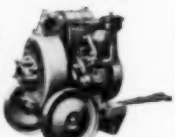
To produce this wide range of crushed slag, Standard's plant is equipped with the following machinery: 3 reciprocating feeders — one feeds from the hopper, another to a pan conveyor and a third feeds to the primary crusher; approximately 1,000 feet of conveyor; one chain and three belt elevators; four crushers — a Gates 8-ft. primary, a Symons 4-ft. standard, a Symons 4-ft. short head, and a Pioneer 54X24; Two 5X24-ft. Allis-Chalmers revolving screens; four double deck Niagara-type screens — 4X8, 4X10, 4X12 and 4X14; a 4X12 Seco double

2100 gallons every 1150 revolutions



JAEGER pumps pull stronger, pump longer

Because Jaeger dewatering pumps are built oversize, to produce full rated volume at easier speeds, they also hold more priming water and are subject to less abrasive wear. Combined with double priming action and positively lubricated seal (Jaeger patents) they insure fast, sure priming without vapor lock on the toughest pulls, sustained efficiency on non-stop pumping, and thousands of extra hours of service from both pumps and engines.



3P
Others 1½" to 10"

See your Jaeger distributor or send for Catalog P-10.

THE JAEGER MACHINE CO. 553 Dublin Ave., Columbus 16, Ohio

COMPRESSORS • MIXERS • HOISTS • TOWERS • PAVING MACHINERY

decker; and a 4X10 Niagara single deck screen. Most of the screens are of the sloped shaking type. Magnetic separators remove iron that has gotten past scrap pickers — men who watch the feeders.

Work in Yard

Much of the mill output is stockpiled in adjoining company yards. Two 1¼-yd. clamshell locomotive cranes — an American and an Ohio — team up with a ¾-yd. Marion 331 gas shovel to handle the yard work. Crushed slag is loaded from yard stocks by two Haiss loaders, an 80 and a 75.

None of the Standard Slag Company's output is delivered. It is either hauled away in gondolas or picked up in trucks by the contractors who use it. The plant produces some 600,000 tons per year and the current selling price is $1.50. Due to a shortage of river sand in the area, the company has recently gone into the sand business. This they sell to their slag customers who are making concrete. Thirty-four men are on the plant's payroll. They work a 48-hour week with one day off during the week.

A small waste dump is maintained 20 miles west of Youngstown. Here unsalable material is spoiled.

Cleveland Slag Co.

There are 28 plants in the Standard Slag Co. organization. In nearby Cleveland, the subsidiary is called the Cleveland Slag Co. The layout here is similar except that the distance from the modified pit to the plant is several miles. A 2½-yd. Bucyrus-Erie 54-B electric shovel loads the slag to bottom-dump railroad cars which carry the material to the crushing mill. Slag is taken from three furnaces of the Corrigan-McKinney plant of Republic Steel. Not all of the subsidiary plants handle slag exclusively; they also prepare sand, gravel and stone.

Standard Slag Personnel

At Youngstown, Earl Mayers is superintendent of the plant. Bill Allison is district superintendent. District superintendent of the Cleveland area is Paul Miller. K. K. Kagarise is the general superintendent.

President of Standard Slag Co. is L. A. Beeghley; vice president is W. E. Bliss; and W. H. Kilcawley is the secretary-treasurer. R. D. Cline is the purchasing agent.

OWEN BUCKETS
can Take It!
Deep Penetration—Proper Balance. Specially curved shells close with maximum leverage—"A Mouthful at Every Bite!"
and Dish It Out!
Rapid Darkes Opening—Interior shell surfaces, properly curved and free from obstructions, assure fast, complete discharge of all materials.
"A mouthful at every bite"
Buckets AND Grapples
Write for Catalog
THE OWEN BUCKET CO.
6095 Breakwater Ave., Cleveland, Ohio
Branches: New York; Philadelphia; Chicago; Berkeley, Calif.

New Equipment

Continued from page 51

that will accept standard generator housings. Flywheel driving member and adapter ring accept a standard No. 4 S.A.E. clutch.

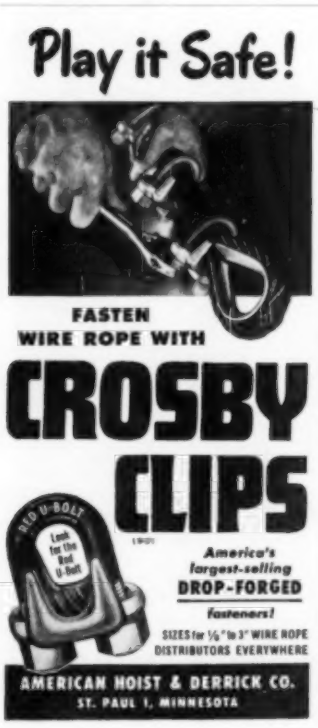
Other services as well as generating duty invite consideration of the Armstrong-Siddeley air-cooled diesels. The two-cylinder model is ideal as a marine propulsion unit and both models are already giving economical and unfailing service in powering farm machinery, pumps of all types, brick crushers, compressors, cement mixers, saw mills, etc.

Mobile Mixer

Manufacturer: Blaw-Knox Co., Pittsburgh, Pa.

Claims: Hi-Boy mixer is a result of a 2-year engineering research program and has resulted in a reduction in weight, improved performance and extreme accessibility. The weight of the 3-yd. model has been reduced by a full ton and the 4½-yd. model by a half ton, without sacrificing ruggedness required in truck mixer construction.

Features are: a 3-way, non-by-passing piston type water valve that makes possible a greatly simplified piping system; a new double-strand roller chain drive which automatically compensates for misalignment between drum and drive shaft caused by operation over rough roads; a new compact and simplified transmission of most modern automotive design.



Engine Line

Manufacturer: Murphy Diesel Co., Milwaukee 14, Wis.

Claims: Heavy duty diesel engines, consisting of six models from 145 to 220 hp, are designed to operate at continuous speeds up to 1,400 rpm. This higher operating speed will make possible the application of Murphy diesels in many new services including those requiring torque converter power transmission.

Long Tape Rule

Manufacturer: Master Rule Manufacturing Co., Inc., Middletown, N. Y.

Claims: Engineer's tape which requires neither rewind-crank nor hand-reel comes in 10 and 100-ft. lengths. The easy interchangeability of rule blades makes it possible to replace tapes divided in eighths of an inch by tapes divided in tenths and hundredths of a foot, right on the job. Thus, worn or damaged tapes can be replaced without discarding the case or rewind mechanism.

The Longboy rewinds with a constant retracting torque, whether the full 50 feet or only the last inch is out — a virtue made possible by the incorporation of the new neg'ator-type spring in its planetary coiling mechanism. Simple thumb pressure on the center plate-button starts the rewind; release of this pressure stops the action instantly.

The case, of formed steel and covered with tough fabricord, is sealed against dust and dirt. The tape itself is ⅜-in. wide and made of high-carbon spring steel, nickel-plated for protection from moisture. Internal parts are all of corrosion-resisting materials. Graduations are black for easy reading. Weight is 23 ounces; case diameter five inches.

Small Heater

Manufacturer: Portable Heater Co., Cleveland, Ohio.

Claims: Capable of raising the temperature of a cold room from 30° to 80° within 20 minutes without odor, fumes, grease, or smoke, the Portable Heater enables workmen entering a cold building or one under construction to have comfortable working conditions within a few minutes. Weighing only 55 pounds, and designed for easy, economical operation, it needs no manual pumping. Concentrated fuel, hot test bottled gas is held under pressure in a 20-lb. cylinder. Tests show that fuel costs average $1.00 per day for continuous 8-hour operation.

Earth Auger

Manufacturer: Trackson Co., Milwaukee, Wis.

Claims: A fast, dependable, earth boring and pole setting machine, the earth auger assures construction firms; telephone, telegraph and power companies; railroads, and highway departments a full range of boring positions for drilling holes vertically or at any usable angle.

The EA4 will drill holes 9 inches to 24 inches in diameter, to a depth of eight feet with the standard 13-ft. bar or to a depth of 11 feet with the optional 16-ft. bar. Larger diameter holes can be bored under certain conditions. The solid auger bar is square, permitting full bearing contact through the driving head. It has a 5,000-lb. capacity which handles poles up to 50 feet in length.

The auger unit is compactly mounted on the Caterpillar D4 tractor for running over rough ground or working in close quarters. The tractor has the 5-roller non-oscillating track frame, large front idlers and 16-in. grouser tracks which provide stability and balance in all types of terrain.

It is an ideal unit for drilling holes for poles, anchor holes or tower footings and for setting power line poles. Heavy duty track roller guards are offered as added protection for operations under adverse conditions.

Manufacturers Notes

Continued from page 54

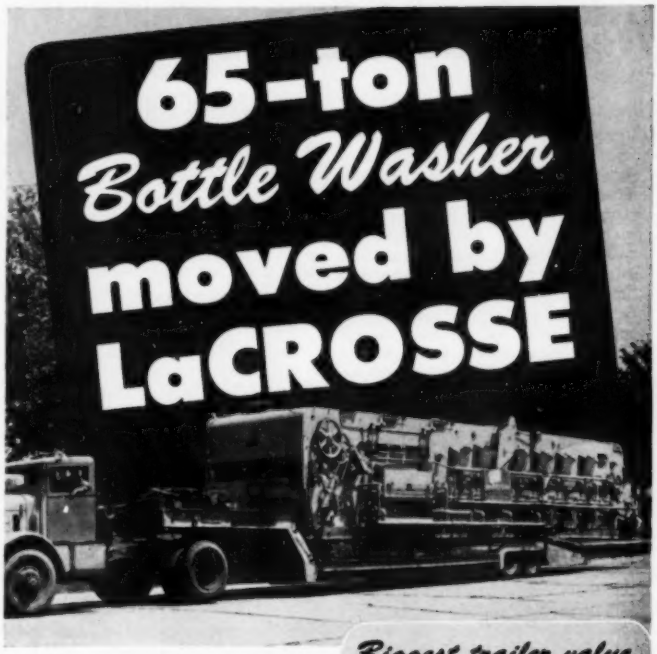
Watts is a graduate of Northwestern University. In 1947, he was appointed manager of the general wire sales department. In addition to this duty, in 1949, he was selected to head the newly opened Detroit district sales office as manager. He relinquished this managership in August of 1950. In the same year, he established and managed the pig iron and semi-finished sales department. Mr. Watts, who will headquarter in New York, is being succeeded by R. M. Wagner.

Cummins Engine Company, Inc., Columbus, Ind. has added 9,600 sq. ft. on the DD fuel pump building, completed only 18 months ago, and new machinery for increasing the manufacturing capacity for the recently announced new Cummins DD fuel pump and component parts. An expenditure of about $400,000 is involved. These new facilities, which are expected to be ready for use early in the second quarter, will increase the size of the plant more than 30% and boost to more than $6 million the amount Cummins will have expended since the end of World War II for additional manufacturing facilities and for modernizing the Columbus plant.

Warner Electric Brake & Clutch Co., Beloit, Wis., has named Thomas O. McMillan eastern district representative. McMillan plans to make Lebanon, Pa., his headquarters and will service the entire eastern area with the exception of part of New Jersey and New York City.

Worthington Pump and Machinery Corp. has signed a distributorship agreement with Hutchinson Foundry and Steel Co., Hutchinson, Kans., to handle construction equipment, including mixers, placers, air tools, centrifugal pumps and suction and discharge hoses. The company has been serving the south central Kansas area for the past 38 years.

Fafnir Bearing Co., New Britain, Conn., announces the recent removal to larger, more modern quarters of three of its branch offices and warehouses. The new locations are Charlotte Branch Office and Warehouse, 119 West 29th St., Charlotte 6, N. C., Chicago Branch Office and Warehouse: 3334 West Newport Ave., Chicago 18, Ill., Cincinnati Sales Office: 920 E. McMillen St., Cincinnati 6, Ohio.



To minimize danger of costly damage in moving this elaborate 11'x 48' bottle washing plant, a leading Milwaukee hauler wisely selected a 67-ton capacity La Crosse DF-12 trailer, with double oscillating axles. The huge 65-ton washer — capable of cleaning and sterilizing 16,800 bottles per hr. — was safely loaded, transported and installed in just a few days. You, too, can simplify hauling problems with La Crosse heavy-duty trailers — low boys or tilt tops.

Biggest trailer value for your money!

- Up to 2000 lbs. less dead-weight per trailer!
- Stronger *full-length* welded frame . . . no cut flanges!
- Bigger, more powerful S-cam brakes with slack adjusters!
- Tougher, longer-lasting bolt-on type brake linings.
- Extra-wide base rims for longer tire life.
- Stronger axles . . . smoother tighter-fitting decks.

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Check Today!

LA CROSSE TRAILER CORPORATION, La Crosse, Wis.

☐ Rush complete information on La Crosse trailers:
☐ Specifications ☐ Prices ☐ Delivery
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☐ We may buy a ..... ton trailer about ..... (date)

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LaCROSSE
America's Favorite LOW BED TRAILER

New trade literature

Title: **Conveyor Belting**

Subject: Publication describes all belt features, explains why increased service life with decreased maintenance are made possible by the construction and tells the function which each part of the belt performs, as well as significant data on each belt in the company's line. The products described are conveyor and elevator belts, Cord conveyor belts, material conveyor belts, hot material conveyor belts, industrial elevator belts and special conveyor belt constructions.

Where to get: B. F. Goodrich Co., Akron, Ohio. (Free)

Title: **Steel Sheeting**

Subject: How to use lightweight corrugated steel sheeting to effectively control movement of soil or water is described. Photographic case-histories are presented to show that corrugated sheeting has ample strength, is fast driving and results in lower costs. Also included in the booklet are data on driving and properties of both types of Armco sheeting as well as a method of figuring sizes and spacing of wales and struts.

Where to get: Armco Drainage & Metal Products, Inc., Middletown, Ohio. (Free)

Title: **Difficult Construction**

Subject: For several years the Arthur A. Johnson Corp. has kept a diary of the inventive devices and techniques used in completing their many projects. This information has been published as a concise, illustrated history of the 30-year old company. It is a construction story of elements not visible to the sidewalk superintendent, but without which few contracts could have been completed successfully.

Where to get: Arthur A. Johnson Corp., 347 Madison Ave., NYC 17. (Free)

Title: **Cab Heaters**

Subject: Brief descriptions and specifications of the complete line of Hunter gasoline-burning cab and cargo heaters and dry-ice cargo refrigeration systems are given. Illustrated with photographs and drawings of various models, it also contains drawings of recommended installations.

Where to get: Hunter Manufacturing Co., 1550 East 17th St., Cleveland 14, Ohio. (Free)

Title: **Revolver Cranes**

Subject: Illustrated book of the nation's greatest dam jobs — Garrison, Friant, Grand Coulee, Bull Shoals and others. The pages in pictures tell how dam builders use the size, power and reach of Revolver Cranes on some of the world's biggest construction jobs.

Where to get: American Hoist & Derrick Co., St. Paul 1, Minn. (Free)

Title: **1-Yd. Excavator**

Subject: Bulletin lists and illustrates the Marion 43-M's applications as a shovel, dragline, clamshell, crane, backhoe and pile driver. The machine is designed for use in construction, bridge and road work, drainage and reclamation, quarrying, industries, coal and metal mining and un-

Continued on page 64

McCarthy Drills PAY OFF!

SELF-PROPELLED HORIZONTAL DRILL

FOR BLAST HOLE DRILLING

● Heavy all welded steel carriage and four individually adjustable leveling jacks make setups faster, drilling smoother. Fingertip hydraulic control permits instantaneous change of drilling feed. Bores 5 to 10-inch diameter blast holes to horizontal depths of 170 ft. or more.

Heavy-Rugged

✓ McCARTHY DRILLS PAY THEIR WAY
✓ MAKE MORE MONEY FOR YOU
✓ RECORDS SHOW 40% MORE HOLES
✓ LIST OF USERS ON REQUEST

● McCarthy Vertical Drills adapt to any job where ordinary rock formations are to be blasted.

Designed with compact retractable hydraulic tower for Truck, "Cat," Half-track or Jumbo mountings. Power shafts made of tough alloy steel. Simplified construction throughout.

Over-all height with tower reclining: 7 ft., 4 in. Wt.: 5,100 lbs. All McCarthy units can be operated with Gasoline, Diesel or Electric power units. Write for descriptive literature.

Powerful

VERTICAL DRILL

FIFTY YEARS DRILLING EXPERIENCE 1901-1951

MANUFACTURED BY
THE SALEM TOOL COMPANY
SALEM, OHIO, U. S. A.

STUMPS, ROCK or DIRT

BUCYRUS-ERIE BULLGRADERS ROLL RIGHT THROUGH

OUT GO STUMPS — DOUBLE QUICK — Underbrush and stumps are rooted out in a hurry as this pair builds streets for a new subdivision. At left, an International TD-14 with Bucyrus-Erie hydraulic Bullgrader. At right, International TD-18 with Bucyrus-Erie cable Bullgrader.

STUMPS, rock, clay, dirt — whatever the material road builders are up against, they can depend on Bucyrus-Erie Bullgraders to keep it rolling — fast.

Bucyrus-Erie "Power Point" Bullgrader design matches the Bullgrader so exactly to the International tractor that tractor *power* is concentrated right at the *point* where it belongs — the blade. And the blade is scientifically curved to keep dirt live and rolling — the easiest and cheapest way to move it.

In addition, Bucyrus-Erie Bullgraders are built to last. Pearlitic manganese steel gives the blade an armor face that takes the roughest kind of punishment — and comes back for more. For full details, see your nearby International Industrial Tractor Distributor.

2667S1C

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

ROCK GOES TOO — Here a Bucyrus-Erie hydraulic Bullgrader and International TD-9 tractor clean out a rock pile. Note the excellent operator visibility.

SO DOES DIRT . . . as this Bucyrus-Erie cable Bullgrader and International TD-18A tractor speed grading on a county highway.

See Your INTERNATIONAL Industrial Tractor Distributor

Sand Mines

Continued from page 25

way and into Mexico City for distribution at I.C.A. construction jobs. Of all the material obtained, 70% is sand and 30% is gravel.

At present, there are two 8-hour shifts, 50 workers on the first, from 7 AM to 3 PM and 25 men on the second shift from 3 to 11 PM. Workers earn 5.25 pesos — less than 85 cents U. S. currency per day. The laborers who drill blast holes are paid 2.50 pesos — about 30 cents — per lineal yard of drilling. Only the shovel operators rate top salaries of 350 pesos — about 40 U. S. dollars a week, an extraordinary wage by Mexico City standards.

Although labor is cheap, machinery is of the utmost importance because of the volume of production needed for construction contracts. Profits increase in relation to production obtained. (Mexico is not alone in this.)

Monthly production at present is 22,500 tons of sand and gravel. Every day, I.C.A. trucks make about 250 journeys from the mine into the city, hauling sand and gravel.

During the four years of operation there have been only minor accidents at *La Esperanza*. This is a good record considering that workmen armed with picks are loosening sand 40 feet above the pit floor.

There are two mine operating problems: The first, an economical one, is removing the layer of overburden. During the operation there are no profits to balance mining costs as surface seam is made up of waste matter. The second problem, technical, is how to prevent waste from mixing with the commercial material when stripping. A direct cut made down to the pink sand floor is the best solution to this.

I.C.A. plans to continue drilling as far down as trucks can haul out material. *La Esperanza* tract is not large enough to allow a longer access road at a convenient grade and naturally, if the pit becomes too deep, the road would be too steep for trucks to drive up.

During the past three years the I.C.A. has risen to the very top of the Mexican construction scene. One job alone, the *Centro Presidente Alemán*, has been so outstanding as to place the organization in a category by itself.

This 22½ million peso job is a group of six buildings with a total of 1,080 apartments, available only to federal employees earning not more than 640 pesos a month. It is the most successful housing project of the present administration.

At present, the I.C.A. is building another huge, government - sponsored housing center at a 28 million peso cost. The organization is responsible for hundreds of houses and scores of branch roads, irrigation canals, sewage systems and dams.

A unique feature of the I.C.A. is that it is exclusively a young men's organization. Ten years ago, a 19-year old student of engineering in Mexico's National University, Bernardo Quintana, planned the I.C.A. His first step was to group a half dozen students and to undertake small construction jobs in collaboration, investing the profits obtained. Today, 200 engineers, all young — the majority are under 30 — share holders of I.C.A., are building modern Mexico. Bernardo Quintana is general manager, largest stock holder, and heads the board of directors.

HAYWARD BUCKETS

WON'T QUIT OR CAUSE TIME OUT

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

THE HAYWARD CO.
52-54 Church Street
New York, N. Y.

SAVINGS FLOW FROM SPEED-LAY PIPE SYSTEM

EVERYTHING for a COMPLETE PORTABLE PIPE SYSTEM

FACTORY PACKAGED • PIPE COUPLINGS • FITTINGS • VALVES ACCESSORIES • LIGHTWEIGHT, SAVES LABOR • FAST, SIMPLE

Immediate Installation

by one unskilled man. 2½ to 12½ o.d. black or galvanized. Larger sizes can be furnished. Ready to lay—without delay.

DELIVERED READY FOR INSTALLATION

SEND COUPON NOW!

ALBERT PIPE SUPPLY CO., INC.
Berry & N. 13th St. Brooklyn 11, N. Y.

Please send free booklet describing your Speed-Lay Pipe System and services.

NAME .....
FIRM NAME .....
ADDRESS .....
CITY ..... STATE .....

Lend a Hand!

Crippled Children need YOUR help

So many handicapped children need proper medical care and special training! Every penny you give will help! All these youngsters want is a chance to grow up straight and strong . . . to become useful happy citizens. Give now, won't you? Help crippled children.

18th ANNUAL EASTER SEAL APPEAL FEB. 25 to MAR. 25

TO ADVERTISE: All advertising in this section is payable in advance. Rate: 60c per line, or $7.20 per inch of 12 lines. Minimum charge $2.40. No discounts; no commissions. Please count your copy carefully to avoid delay. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Be sure to enclose the correct amount of money with your order. Closing date — 15th of preceding month. Example: January closes December 15th.

TO INQUIRE: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

1—31-B Bucyrus-Erie steam shovel.
1—120-B Bucyrus-Erie steam shovel.
1—No. 490 Marion electric shovel.
50-B steam shovel new parts.
50-B boom and dipper handles.

New York Trap Rock Corporation
230 Park Ave. at 46th St., New York 17, N. Y.

No. 15-62 model 7200, Marion walking dragline, 185' boom, 24' diameter base, powered by Fairbanks-Morse, model 35, six-cylinder diesel engine driving the hoist and drag machinery. Cummins H15-600, six-cylinder diesel engine driving the generator for furnishing current to the independent swing machinery. Location Wyoming. Box 3430

Lima 2400 shovel equipped with 50 foot boom, 40 foot sticks and 5½ cu. yd. dipper. Location Central United States. Address inquiries to Box No. 3435.

LIMA MODEL 802

Combination shovel, clamshell, dragline, 40" treads, 50' boom with 20' insert. Caterpillar D17000 engine, 2 cu. yd. shovel dipper. New October 1945. Location New York. Priced right. Inquire Box 3432, c/o Excavating Engineer.

Northwest model 25; 6; 85D; 95. Manitowoc 3500; 4500 new — will rent. Bucyrus 54-B; Monighan 5W; 7W; 9W; 450.

A. W. Nevers Phone 22 Mt. Pleasant, Iowa

New Bucyrus-Erie 87-B shovel front end complete.

N. Formaby
Route No. 4 Ft. Lee, New Jersey

TOURNAPULLS IMMEDIATELY AVAILABLE. Three units model C1 Tournapulls, mounted on two 21:00 x 24:00 20-ply tires with model LP scrapers. Thoroughly reconditioned ready to roll. $6500 each. Loaded on cars.

H. O. Penn Machinery Company, Inc.
140th St. and East River
New York 54, N. Y.

7—all-steel rocker dump cars, roller bearing, 30" gauge, 1 yd. 7 tons steel rails, 16 to 30 lb. straight and serviceable with 8 switches. One Bucyrus-Erie scraper, 4½ yd., 4-wheel. All of above in excellent condition.

Kentucky Clay Mining Company
Mayfield, Kentucky

New shovel front attachment complete with two-yard dipper, for Model 820 Lorain.

F. W. Evans
301 Joplin Street Joplin, Missouri

New Dragline Buckets

2½ cubic yard Type AX dragline bucket. (Reconditioned.)

3 cubic yard Red Arch, Type AY heavy duty bucket.

Bucyrus-Erie Company
Parts Division
South Milwaukee, Wisconsin

EQUIPMENT WANTED

WANTED

3 to 5 yard CRANE. To Rent for Use in Detroit Area.

Box 3433

Wanted: One 2 to 3 yd. electric crawler crane or clamshell. Advise age, mfr., approx. location and price. Box 3427

HELP WANTED

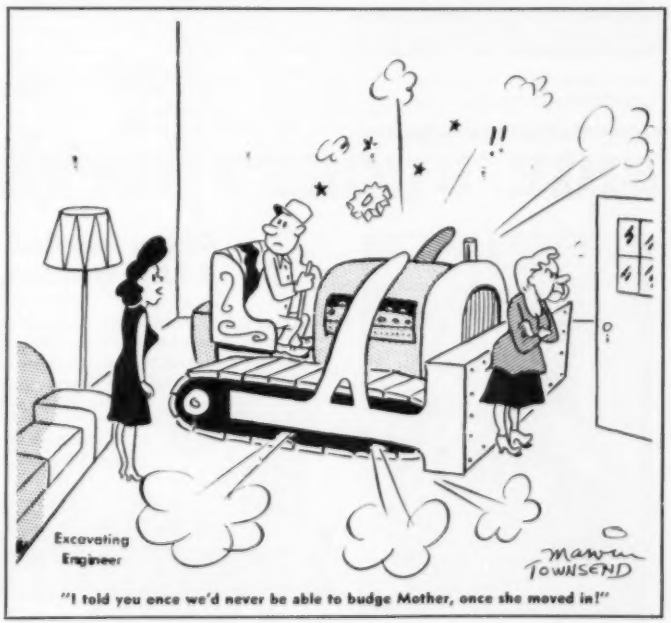
EXPORT SERVICE ENGINEER required by manufacturer of tractor equipment. Should be well advised on crawler tractors and allied equipment. Must be willing to travel abroad. Box 3429

POSITIONS WANTED

Position wanted as shovel operator. Can operate any make of machine; shovel; dragline; clamshell, or crane. Steam, gas, diesel, or electric. Large or small machines. Also experienced on water well rigs. Virgil Dick, P.O. Box 8, Hurricane, West Virginia. Phone 2224.

Gen. supt. or supt. available. Experience covers 25 year supervising, estimating and building all classes of excavating; railroads; highways; airports; earth-fill dams; large sewers. Honest, sober, reliable. Best of references. Box 3429

Power shovel and excavating equipment operator. A-1 mechanic. Will go anywhere. Now located in Maryland. Box 3431



"I told you once we'd never be able to budge Mother, once she moved in!"

New Trade Literature

Continued from page 60

derground work. Features described in the bulletin include: ease of front-end conversion; 22 important friction points equipped with ball or roller bearings; shafting of alloy steel; machine-cut, heat-treated gears; forged crawler rollers and crawler pads.

Where to get: Marion Power Shovel Co., Marion, Ohio. (Free)

Title: **Repairing Worn Buckets**

Subject: An informative folder describing the rebuilding and repairing of worn buckets with Manganal 11% to 13½% manganese-nickel steel products. It also tells how to salvage many other worn parts such as hammermill hammers, truck bottoms, crusher parts, tractors sprockets and pads, shovel and drag-line bucket teeth, conveyor chain wear-strips and chutes.

Where to get: Stulz-Sickles Co., 134 Lafayette St., Newark 5, N. J. (Free)

Title: **Welding Buyers Guide**

Subject: Booklet tells a buyer how to select the particular alloys and fluxes that best meet his needs. The material is organized and cross-referenced so that right selection is virtually automatic. All current All-State products are covered, including several new ones recently developed. Of particular interest in material production is a new aluminum solder rod for soldering iron application, a premium silver brazing rod and a silver brazing rod made especially for carbide tool tipping.

Where to get: All-State Welding Alloys Co., Inc., 273 Ferris Ave., White Plains, N. Y. (Free)

Title: **The Tool for the Job**

Subject: Kodachrome, sound motion picture tells the story of Aircomatic Process for welding aluminum, stainless steel, bronzes and Monel. One of its outstanding features is the exceptional closeup photography of the Aircomatic arc. Through the use of special filters and camera techniques, actual deposition of weld metal and much detail in the arc are brought to the screen. Other aspects of the process are explained by means of animation and demonstration. The manual and automatic welding of such metals as aluminum, stainless steel, bronze and Monel are covered in some detail both in demonstration and laboratory sequences as well as in actual production work. Showing time for this 16mm., two reel, sound motion picture is 21 minutes. This film was especially designed for showing to non-technical as well as technical groups, and is suitable for presentation before such varied groups as purchasing agents' associations, foremen's meetings, trade schools and colleges, sales and engineering meetings and technical society meetings.

Where to get: Air Reduction, 60 East 42nd Street, NYC 17.

DREDGES

HYDRAULIC
DIPPER
CLAMSHELL

Bolted sectional steel hulls for landlocked, inland waters

If you need a dredge, write us!

AMERICAN STEEL DREDGE CO. INC.
FORT WAYNE 1 · INDIANA · U.S.A.

DESIGNERS AND BUILDERS OF DREDGING EQUIPMENT SINCE 1905

Need STEEL SHEET PILING?

RENT IT . . . "FASTER FROM FOSTER"

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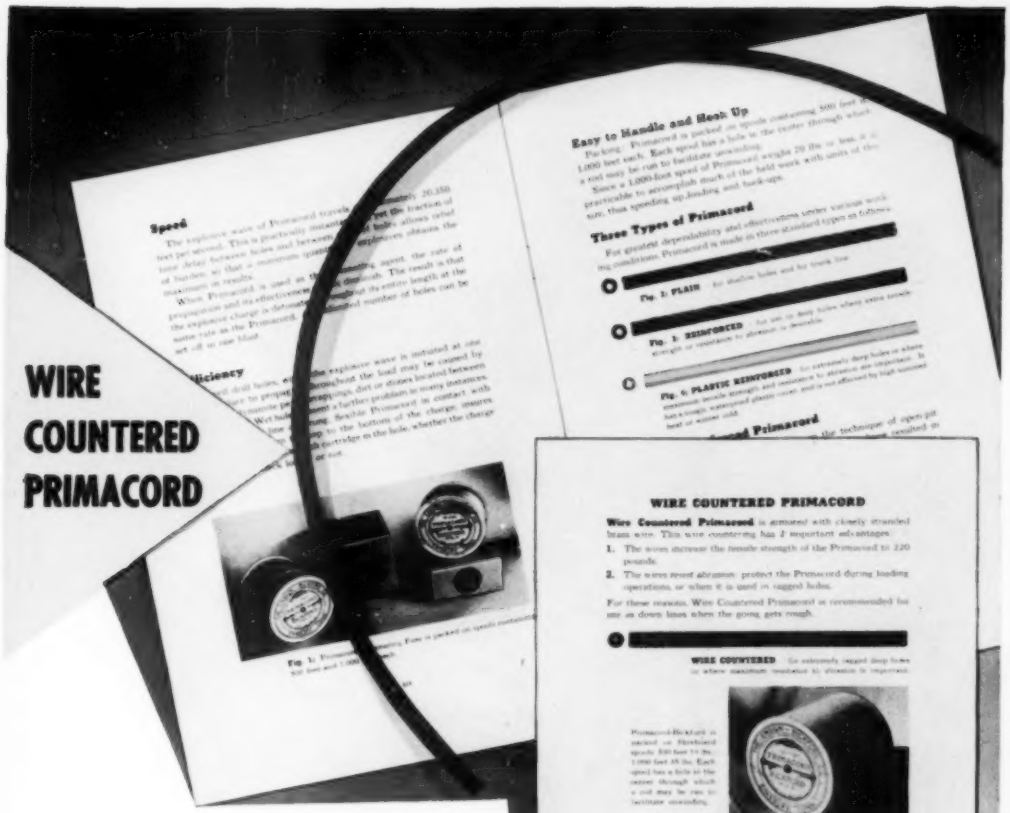
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Easy to Handle and Hook Up
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WIRE COUNTERED
Easy to Handle and Hook Up

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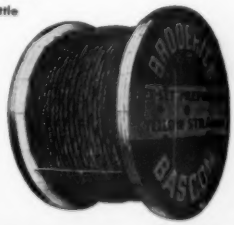
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Yellow Strand
PREFORMED WIRE ROPE